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PROVISIONAL SPECIFICATION

Application Title A Device and Method (IR18)

The invention is described in the following statement:

GH REF: **P23975FU/PJT**

A Device and Method (IR18)

Field of the Invention

The present relates substantially to the concept of a disposable camera having instant printing capabilities and in particular, discloses A Guillotine Device in a Digital Camera System.

Background of the Invention

Recently, the concept of a "single use" disposable camera has become an increasingly popular consumer item. Disposable camera systems presently on the market normally include an internal film roll and a simplified gearing mechanism for traversing the film roll across an imaging system including a shutter and lensing system. The user, after utilising a single film roll returns the camera system to a film development centre for processing. The film roll is taken out of the camera system and processed and the prints returned to the user. The camera system is then able to be re-manufactured through the insertion of a new film roll into the camera system, the replacement of any worn or wearable parts and the re-packaging of the camera system in accordance with requirements. In this way, the concept of a single use "disposable" camera is provided to the consumer.

Recently, a camera system has been proposed by the present applicant which provides for a handheld camera device having an internal print head, image sensor and processing means such that images sense by the image sensing means, are processed by the processing means and adapted to be instantly printed out by the printing means on demand. The proposed camera system further discloses a system of internal "print rolls" carrying print media such as film on to which images are to be printed in addition to ink to supplying the printing means for the printing process. The print roll is further disclosed to be detachable and replaceable within the camera system.

Unfortunately, such a system is likely to only be constructed at a substantial cost and it would be desirable

to provide for a more inexpensive form of instant camera system which maintains a substantial number of the quality aspects of the aforementioned arrangement.

It would be further advantageous to provide for the effective interconnection of the sub components of a camera system.

Summary of the Invention

It is an object of the present invention to provide for the effective incorporation of a guillotine mechanism into a camera system.

In accordance with a first aspect of the present invention, there is provided in a camera system comprising: an image sensor device for sensing an image; a processing means for processing the sensed image; a print media supply means for the supply of print media to a print head; a print head for printing the sensed image on the print media stored internally to the camera system; a portable power supply interconnected to the print head, the sensor and the processing means; and a guillotine mechanism located between the print media supply means and the print head and adapted to cut the print media into sheets of a predetermined size.

Further, preferably, the guillotine mechanism is detachable from the camera system. The guillotine mechanism can be attached to the print media supply means and is detachable from the camera system with the print media supply means. The guillotine mechanism can be mounted on a platten unit below the print head.

Brief Description of the Drawings

Notwithstanding any other forms which may fall within the scope of the present invention, preferred forms of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig. 1 illustrated a side front perspective view of the assembled camera of the preferred embodiment;

Fig. 2 illustrates a back side perspective view, partly exploded, of the preferred embodiment;

Fig. 3 is a side perspective view of the chassis of the preferred embodiment;

Fig. 4 is a side perspective view of the chassis illustrating the insertion of the electric motors;

Fig. 5 is an exploded perspective of the ink supply mechanism of the preferred embodiment;

Fig. 6 is a side perspective of the assembled form of the ink supply mechanism of the preferred embodiment;

Fig. 7 is a front perspective view of the assembled form of the ink supply mechanism of the preferred embodiment;

Fig. 8 is an exploded perspective of the platten unit of the preferred embodiment;

Fig. 9 is a side perspective view of the assembled form of the platten unit;

Fig. 10 is also a perspective view of the assembled form of the platten unit;

Fig. 11 is an exploded perspective unit of the printhead recapping mechanism of the preferred embodiment;

Fig. 12 is a close up exploded perspective of the recapping mechanism of the preferred embodiment;

Fig. 13 is an exploded perspective of the ink supply cartridge of the preferred embodiment;

Fig. 14 is a close up perspective, partly in section of the internal portions of the ink supply cartridge in an assembled form;

Fig. 15 is a schematic block diagram of one form of chip layer of the image capture and processing chip of the preferred embodiment;

Fig. 16 is an exploded perspective illustrating the assembly process of the preferred embodiment;

Fig. 17 illustrates a front exploded perspective view of the assembly process of the preferred embodiment;

Fig. 18 illustrates a side perspective view of the assembly process of the preferred embodiment;

Fig. 19 illustrates a side perspective view of the

assembly process of the preferred embodiment;

Fig. 20 is a perspective view illustrating the insertion of the platten unit in the preferred embodiment;

Fig. 21 illustrates the interconnection of the electrical components of the preferred embodiment;

Fig. 22 illustrates the process of assembling the preferred embodiment; and

Fig. 23 is a perspective view further illustrating the assembly process of the preferred embodiment.

Description of Preferred and Other Embodiments

Turning initially simultaneously to Fig. 1, and Fig. 2 there is illustrated perspective views of an assembled camera constructed in accordance with the preferred embodiment with Fig. 1 showing a front side perspective view and Fig. 2 showing a back side perspective view. The camera 1 includes a paper or plastic film jacket 2 which can include simplified instructions 3 for the operation of the camera system 1. The camera system 1 includes a first "take" button 4 which is depressed to capture an image. The captured image is output via output slot 6. A further copy of the image can be obtained through depressing a second "printer copy" button 7 whilst an LED light 5 is illuminated. The camera system also provides the usual view finder 8 in addition to a CCD image capture/lensing system 9.

The camera system 1 provides for a standard number of output prints after which the camera system 1 ceases to function. A prints left indicator slot 10 is provided to indicate the number of remaining prints. A refund scheme at the point of purchase is assumed to be operational for the return of used camera systems for recycling.

Turning now to Fig. 3, the assembly of the camera system is based around an internal chassis 12 which can be a plastic injection molded part. A pair of paper pinch rollers 28, 29 utilized for decurling are snap fitted into corresponding frame holes eg. 26, 27.

As shown in Fig. 4, the chassis 12 includes a series of mutually opposed prongs eg. 13, 14 into which is snapped fitted a series of electric motors 16, 17. The electric motors 16, 17 can be entirely standard with the motor 16 being of a stepper motor type and include a cogged end portion 19, 20 for driving a series of gear wells. A first set of gear wells is provided for controlling a paper cutter mechanism and a second set is provided for controlling print roll movement.

Turning next to Figs. 5 to 7, there is illustrated an ink supply mechanism 40 utilized in the camera system. Fig. 5 illustrates a back exploded perspective view, Fig. 6 illustrates a back assembled view and Fig. 7 illustrates a front assembled view. The ink supply mechanism 40 is based around an ink supply cartridge 42 which contains printer ink and a print head mechanism for printing out pictures on demand. The ink supply cartridge 42 includes a side aluminium strip 43 which is provided as a shear strip to assist in cutting images from a paper roll.

A dial mechanism 44 is provided for indicating the number of "prints left". The dial mechanism 44 is snap fitted through a corresponding mating portion 46 so as to be freely rotatable.

As shown in Fig. 6, the print head includes a flexible PCB strip 47 which interconnects with the print head and provides for control of the print head. The interconnection between the Flex PCB strip and an image sensor and print head chip can be via Tape Automated Bonding (TAB) Strips 51, 58. A moulded aspherical lens and aperture shim 50 (Fig. 5) is also provided for imaging an image onto the surface of the image sensor chip normally located within cavity 53 and a light box module or hood 52 is provided for snap fitting over the cavity 53 so as to provide for proper light control. A series of decoupling capacitors eg. 34 can also be provided. Further a plug 45 (Fig. 7) is provided for re-plugging ink holes after refilling. A series of guide

prongs eg. 55-57 are further provided for guiding the flexible PCB strip 47.

The ink supply mechanism 40 interacts with a platten unit which guides print media under a printhead located int eh ink supply mechanism. Fig. 8 shows an exploded view of the platten unit 60, while Figs. 9 and 10 show assembled views of the platten unit. The platten unit 60 includes a first pinch roller 61 which is snap fitted to one side of a platten base 62. Attached to a second side of the platten base 62 is a cutting mechanism 63 which traverses the platten by means of a rod 64 having a screwed thread which is rotated by means of cogged wheel 65 which is also fitted to the platten 62. The screwed thread engages a block 67 which includes a cutting wheel 68 fastened via a fastener 69. Also mounted to the block 67 is a counter actuator which includes a prong 71. The prong 71 acts to rotate the dial mechanism 44 of Fig. 6 upon the return traversal of the cutting wheel. As shown previously in Fig. 6, the dial mechanism 44 includes a cogged surface which interacts with pawl lever 73, thereby maintaining a count of the number of photographs taken on the surface of dial mechanism 44. The cutting mechanism 63 is inserted into the platten base 62 by means of a snap fit via receptacle eg. 74.

The platten 62 includes an internal recapping mechanism 80 for recapping the print head when not in use. The recapping mechanism 80 includes a sponge portion 81 and is operated via a solenoid coil so as to provide for recapping of the print head. In the preferred embodiment, there is provided an inexpensive form of printhead re-capping mechanism provided for incorporation into a handheld camera system so as to provide for printhead re-capping of an inkjet printhead.

Fig. 11 illustrates an exploded view of the recapping mechanism whilst Fig. 12 illustrates a close up of the end portion thereof. The re-capping mechanism 90 is structured around a solenoid including a 16 turn coil 75 which can

comprise insulated wire. The coil 75 is turned around a first stationery solenoid arm 76 which is mounted on a bottom surface of the pattern 62(Fig. 8) and includes a post portion 77 to magnify effectiveness of operation. The arm 76 can comprise a ferrous material.

A second moveable arm of the solenoid actuator is also provided 78. The arm 78 being moveable and also made of ferrous material. Mounted on the arm is a sponge portion surrounded by an elastomer strip 79. The elastomer strip 79 is of a generally arcuate cross-section and act as a leaf springs against the surface of the printhead ink supply cartridge 42 (Fig. 5) so as to provide for a seal against the surface of the printhead ink supply cartridge 42. In the quiescent position a elastomer spring units 87, 88 act to resiliently deform the elastomer seal 79 against the surface of the ink supply unit 42.

When it is desired to operate the printhead unit, upon the insertion of paper, the solenoid coil 75 is activated so as to cause the arm 78 to move down to be adjacent to the end plate 76. The arm 78 is held against end plate 76 while the printhead is printing by means of a small "keeper current" in coil 77. Simulation results indicate that the keeper current can be significantly less than the actuation current. Subsequently, after photo printing, the paper is guillotined by the cutting mechanism 63 of Fig. 8 acting against Aluminium Strip 43 of Fig. 5, and rewound so as to clear the area of the re-capping mechanism 88. Subsequently, the current is turned off and springs 87, 88 return the arm 78 so that the elastomer seal is again resting against the printhead ink supply cartridge.

It can be seen that the preferred embodiment provides for a simple and inexpensive means of re-capping a printhead through the utilisation of a solenoid type device having a long rectangular form. Further, the preferred embodiment utilises minimal power in that currents are only required whilst the device is operational and additionally, only a

low keeper current is required whilst the printhead is printing.

Turning next to Fig. 13 and 14, Fig. 13 illustrates an exploded perspective of the ink supply cartridge 42 whilst Fig. 14 illustrates a close up sectional view of a bottom of the ink supply cartridge with the printhead unit in place. The ink supply cartridge 42 is based around a pagewidth printhead 102 which comprises a long slither of silicon having a series of holes etched on the back surface for the supply of ink to a front surface of the silicon wafer for subsequent ejection via a micro electro mechanical system. The form of ejection can be many different forms such as those set out in the relevant provisional patent specifications of the attached appendix. In particular, the ink jet printing system set out in provisional patent specification entitled "An Image Creation Method and Apparatus (IJ38)" filed concurrently herewith is highly suitable. Of course, many other inkjet technologies, as referred to the attached appendix, can also be utilised when constructing a printhead unit 102. The fundamental requirement of the ink supply cartridge 42 being the supply of ink to a series of colour channels etched through the back surface of the printhead 102. In the description of the preferred embodiment, it is assumed that a three colour printing process is to be utilised so as to provide full colour picture output. Hence, the print supply unit 42 includes three ink supply reservoirs being a cyan reservoir 104, a magenta reservoir 105 and a yellow reservoir 106. Each of these reservoirs is required to store ink and includes a corresponding sponge type material 107 - 109 which assists in stabilising ink within the corresponding ink channel and therefore preventing the ink from sloshing back and forth when the printhead is utilised in a handheld camera system. The reservoirs 104, 105, 106 are formed through the mating of first exterior plastic piece 110 mating with a second base piece) 111.

At a first end of the base piece 11 includes a series of air inlet 113 - 115. The air inlet leads to a corresponding winding channel which is hydrophobically treated so as to act as an ink repellent and therefore repel any ink that may flow along the air inlet channel. The air inlet channel further takes a convoluted path further assisting in resisting any ink flow out of the chambers 104 - 106. An adhesive tape portion 117 is provided for sealing the channels within end portion 118.

At the top end, there is included a series of refill holes for refilling corresponding ink supply chambers 104, 105, 106. A plug 121 is provided for sealing the refill holes.

Turning now to Fig. 14, there is illustrated a close up perspective view, partly in section through the ink supply cartridge 42 of Fig. 13 when formed as a unit. The ink supply cartridge includes the three colour ink reservoirs 104, 105, 106 which supply ink to different portions of the back surface of printhead 102 which includes a series of apertures 128 defined therein for carriage of the ink to the front surface.

The ink supply unit includes two guide walls 124, 125 which separate the various ink chambers and are tapered into an end portion abutting the surface of the printhead 102. The guide walls are further mechanically supported and regular spaces by a block portions eg. 126 which are placed at regular intervals along the length of the printhead supply unit. The block portions 126 leaving space at portions close to the back of printhead 102 for the flow of ink around the back surface thereof.

The printhead supply unit is preferably formed from a multi-part plastic injection mould and the mould pieces eg. 10, 11 (Fig. 1) snap together around the sponge pieces 107, 109. Subsequently, a syringe type device can be inserted in the ink refill holes and the ink reservoirs filled with ink with the air flowing out of the air outlets 113 - 115.

Subsequently, the adhesive tape portion 117 and plug 121 are attached and the printhead tested for operation capabilities. Subsequently, the ink supply cartridge 42 can be readily removed for refilling by means of removing the ink supply cartridge, performing a washing cycle, and then utilising the holes for the insertion of a refill syringe filled with ink for refilling the ink chamber before returning the ink supply cartridge 42 to a camera.

Turning now to Fig. 15, there is shown an example layout of the Image Capture and Processing Chip (ICP) 48. The Image Capture and Processing Chip 48 provides most of the electronic functionality of the camera with the exception of the print head chip. The chip 48 is a highly integrated system. It combines CMOS image sensing, analog to digital conversion, digital image processing, DRAM storage, ROM, and miscellaneous control functions in a single chip.

The chip is estimated to be around 32 mm^2 using a leading edge 0.18 micron CMOS/DRAM/APS process. The chip size and cost can scale somewhat with Moore's law, but is dominated by a CMOS active pixel sensor array 201, so scaling is limited as the sensor pixels approach the diffraction limit.

The ICP 48 includes CMOS logic, a CMOS image sensor, DRAM, and analog circuitry. A very small amount of flash memory or other non-volatile memory is also preferably included for protection against reverse engineering.

Alternatively, the ICP can readily be divided into two chips: one for the CMOS imaging array, and the other for the remaining circuitry. The cost of this two chip solution should not be significantly different than the single chip ICP, as the extra cost of packaging and bond-pad area is somewhat cancelled by the reduced total wafer area requiring the color filter fabrication steps. The ICP preferably contains the following functions:

Function
1.5 megapixel image sensor
Analog Signal Processors
Image sensor column decoders
Image sensor row decoders
Analogue to Digital Conversion (ADC)
Column ADC's
Auto exposure
12 Mbits of DRAM
DRAM Address Generator
Color interpolator
Convolver
Color ALU
Halftone matrix ROM
Digital halftoning
Print head interface
8 bit CPU core
Program ROM
Flash memory
Scratchpad SRAM
Parallel interface (8 bit)
Motor drive transistors (5)
Clock PLL
JTAG test interface
Test circuits
Busses
Bond pads

The CPU, DRAM, Image sensor, ROM, Flash memory, Parallel interface, JTAG interface and ADC can be vendor supplied cores. The ICP is intended to run on 1.5V to minimize power consumption and allow convenient operation from two AA type battery cells.

Fig. 15 illustrates a layout of the ICP 48. The ICP 48 is dominated by the imaging array 201, which consumes

around 80% of the chip area. The imaging array is a CMOS 4 transistor active pixel design with a resolution of 1,500 x 1,000. The array can be divided into the conventional configuration, with two green pixels, one red pixel, and one blue pixel in each pixel group. There are 750 x 500 pixel groups in the imaging array.

The latest advances in the field of image sensing and CMOS image sensing in particular can be found in the October, 1997 issue of IEEE Transactions on Electron Devices and, in particular, pages 1689 to 1968. Further, a specific implementation similar to that disclosed in the present application is disclosed in Wong et. al, "CMOS Active Pixel Image Sensors Fabricated Using a 1.8V, 0.25 μm CMOS Technology", IEDM 1996, page 915

The imaging array uses a 4 transistor active pixel design of a standard configuration. To minimize chip area and therefore cost, the image sensor pixels should be as small as feasible with the technology available. With a four transistor cell, the typical pixel size scales as 20 times the lithographic feature size. This allows a minimum pixel area of around 3.6 μm x 3.6 μm. However, the photosite must be substantially above the diffraction limit of the lens. It is also advantageous to have a square photosite, to maximize the margin over the diffraction limit in both horizontal and vertical directions. In this case, the photosite can be specified as 2.5 μm x 2.5 μm. The photosite can be a photogate, pinned photodiode, charge modulation device, or other sensor.

The four transistors are packed as an 'L' shape, rather than a rectangular region, to allow both the pixel and the photosite to be square. This reduces the transistor packing density slightly, increasing pixel size. However, the advantage in avoiding the diffraction limit is greater than the small decrease in packing

density.

The transistors also have a gate length which is longer than the minimum for the process technology. These have been increased from a drawn length of 0.18 micron to a drawn length of 0.36 micron. This is to improve the transistor matching by making the variations in gate length represent a smaller proportion of the total gate length.

The extra gate length, and the 'L' shaped packing, mean that the transistors use more area than the minimum for the technology. Normally, around 8 μm^2 would be required for rectangular packing. Preferably, 9.75 μm^2 has been allowed for the transistors.

The total area for each pixel is 16 μm^2, resulting from a pixel size of 4 µm x 4 µm. With a resolution of 1,500 x 1,000, the area of the imaging array 101 is 6,000 µm x 4,000 µm, or 24 mm^2.

The presence of a color image sensor on the chip affects the process required in two major ways:

- The CMOS fabrication process should be optimized to minimize dark current

- Color filters are required. These can be fabricated using dyed photosensitive polyimides, resulting in an added process complexity of three spin coatings, three photolithographic steps, three development steps, and three hardbakes.

There are 15,000 analog signal processors (ASPs) 205, one for each of the columns of the sensor. The ASPs amplify the signal, provide a dark current reference, sample and hold the signal, and suppress the fixed pattern noise (FPN).

There are 375 analog to digital converters 206, one for each four columns of the sensor array. These may be delta-sigma or successive approximation type ADC's. A row of low column ADC's are used to reduce the conversion

speed required, and the amount of analog signal degradation incurred before the signal is converted to digital. This also eliminates the hot spot (affecting local dark current) and the substrate coupled noise that would occur if a single high speed ADC was used. Each ADC also has two four bit DAC's which trim the offset and scale of the ADC to further reduce FPN variations between columns. These DAC's are controlled by data stored in flash memory during chip testing.

The column select logic 204 is a 1:1500 decoder which enables the appropriate digital output of the ADCs onto the output bus. As each ADC is shared by four columns, the least significant two bits of the row select control 4 input analog multiplexors.

A row decoder 207 is a 1:1000 decoder which enables the appropriate row of the active pixel sensor array. This selects which of the 1000 rows of the imaging array is connected to analog signal processors. As the rows are always accessed in sequence, the row select logic can be implemented as a shift register.

An auto exposure system 208 adjusts the reference voltage of the ADC 205 in response to the maximum intensity sensed during the previous frame period. Data from the green pixels is passed through a digital peak detector. The peak value of the image frame period before capture (the reference frame) is provided to a digital to analogue converter(DAC), which generates the global reference voltage for the column ADCs. The peak detector is reset at the beginning of the reference frame. The minimum and maximum values of the three RGB color components are also collected for color correction.

The second largest section of the chip is consumed by a DRAM 210 used to hold the image. To store the 1,500 x 1,000 image from the sensor without compression, 1.5 Mbytes of DRAM 210 are required. This equals 12 Mbits, or slightly less than 5% of a 256 Mbit DRAM. The DRAM

technology assumed is of the 256 Mbit generation implemented using 0.18µm CMOS.

Using a standard 8F cell, the area taken by the memory array is 3.11 mm^2. When row decoders, column sensors, redundancy, and other factors are taken into account, the DRAM requires around 4 mm^2.

This DRAM 210 can be mostly eliminated if analog storage of the image signal can be accurately maintained in the CMOS imaging array for the two seconds required to print the photo. However, digital storage of the image is preferable as it is maintained without degradation, is insensitive to noise, and allows copies of the photo to be printed considerably later.

A DRAM address generator 211 provides the write and read addresses to the DRAM 210. Under normal operation, the write address is determined by the order of the data read from the CMOS image sensor 201. This will typically be a simple raster format. However, the data can be read from the sensor 201 in any order, if matching write addresses to the DRAM are generated. The read order from the DRAM 210 will normally simply match the requirements of a color interpolator and the print head. As the cyan, magenta, and yellow rows of the print head are necessarily offset by a few pixels to allow space for nozzle actuators, the colors are not read from the DRAM simultaneously. However, there is plenty of time to read all of the data from the DRAM many times during the printing process. This capability is used to eliminate the need for FIFOs in the print head interface, thereby saving chip area. All three RGB image components can be read from the DRAM each time color data is required. This allows a color space converter to provide a more sophisticated conversion than a simple linear RGB to CMY conversion.

Also, to allow two dimensional filtering of the image data without requiring line buffers, data is re-read from

the DRAM array.

The address generator may also implement image effects in certain models of camera. For example, passport photos are generated by a manipulation of the read addresses to the DRAM. Also, image framing effects (where the central image is reduced), image warps, and kaleidoscopic effects can all be generated by manipulating the read addresses of the DRAM.

While the address generator 211 may be implemented with substantial complexity if effects are built into the standard chip, the chip area required for the address generator is small, as it consists only of address counters and a moderate amount of random logic.

A color interpolator 214 converts the interleaved pattern of red, 2 x green, and blue pixels into RGB pixels. It consists of three 8 bit adders and associated registers. The divisions are by either 2 (for green) or 4 (for red and blue) so they can be implemented as fixed shifts in the output connections of the adders.

A convolver 215 is provided as a sharpening filter which applies a small convolution kernel (5 x 5) to the red, green, and blue planes of the image. The convolution kernel for the green plane is different from that of the red and blue planes, as green has twice as many samples.

The sharpening filter has five functions:

- To improve the color interpolation from the linear interpolation provided by the color interpolator, to a close approximation of a sinc interpolation.
- To compensate for the image 'softening' which occurs during digitization.
- To adjust the image sharpness to match average consumer preferences, which are typically for the image to be slightly sharper than reality. As the single use camera is intended as a consumer product, and not a professional photographic products, the processing can match the most popular settings, rather than the most accurate.

- To suppress the sharpening of high frequency (individual pixel) noise. The function is similar to the 'unsharp mask' process.

- To antialias Image Warping.

These functions are all combined into a single convolution matrix. As the pixel rate is low (less than 1 Mpixel per second) the total number of multiplies required for the three color channels is 56 million multiplies per second. This can be provided by a single multiplier. Fifty bytes of coefficient ROM are also required.

A color ALU 113 combines the functions of color compensation and color space conversion into the one matrix multiplication, which is applied to every pixel of the frame. As with sharpening, the color correction should match the most popular settings, rather than the most accurate.

A color compensation circuit of the color ALU provides compensation for the lighting of the photo. The vast majority of photographs are substantially improved by a simple color compensation, which independently normalizes the contrast and brightness of the three color components.

A color look-up table (CLUT) 212 is provided for each color component. These are three separate 256 x 8 SRAMs, requiring a total of 6,144 bits. The CLUTs are used as part of the color correction process. They are also used for color special effects, such as stochastically selected "wild color" effects.

A color space conversion system of the color ALU converts from the RGB color space of the image sensor to the CMY color space of the printer. The simplest conversion is a 1's complement of the RGB data. However, this simple conversion assumes perfect linearity of both color spaces, and perfect dye spectra for both the color filters of the image sensor, and the ink dyes. At the other extreme is a tri-linear interpolation of a sampled

three dimensional arbitrary transform table. This can effectively match any non-linearity or differences in either color space. Such a system is usually necessary to obtain good color space conversion when the print engine is a color electrophotographic

However, since the non-linearity of a halftoned ink jet output is very small, a simpler system can be used. A simple matrix multiply can provide excellent results. This requires nine multiplies and six additions per contone pixel. However, since the contone pixel rate is low (less than 1 Mpixel/sec) these operations can share a single multiplier and adder. The multiplier and adder are used in a color ALU which is shared with the color compensation function.

Digital halftoning can performed as a dispersed dot ordered dither using a stochastic optimized dither cell. A halftone matrix ROM 116 is provided for storing dither cell coefficients. A dither cell size of 32 x 32 is adequate to ensure that the cell repeat cycle is not visible. The three colors - cyan, magenta, and yellow - are all dithered using the same cell, to ensure maximum co-positioning of the ink dots. This minimizes 'muddying' of the mid-tones which results from bleed of dyes from one dot to adjacent dots while still wet. The total ROM size required is 1 KByte, as the one ROM is shared by the halftoning units for each of the three colors.

The digital halftoning used is dispersed dot ordered dither with stochastic optimized dither matrix. While dithering does not produce an image quite as 'sharp' as error diffusion, it does produce a more accurate image with fewer artifacts. The image sharpening produced by error diffusion is artificial, and less controllable and accurate than 'unsharp mask' filtering performed in the contone domain. The high print resolution (1,600 dpi x 1,600 dpi) results in excellent quality when using a well formed stochastic dither matrix.

Digital halftoning is performed by a digital halftoning unit 217 using a simple comparison between the contone information from the DRAM 210 and the contents of the dither matrix 216. During the halftone process, the resolution of the image is changed from the 250 dpi of the captured contone image to the 1,600 dpi of the printed image. Each contone pixel is converted to an average of 40.96 halftone dots.

The ICP incorporates an 16 bit microcontroller CPU core 219 to run the miscellaneous camera functions, such as reading the buttons, controlling the motor and solenoids, setting up the hardware, and authenticating the refill station. The processing power required by the CPU is very modest, and a wide variety of processor cores can be used. As the entire CPU program is run from a small ROM 220. Program compatibility between camera versions is not important, as no external programs are run. A 2 Mbit (256 Kbyte) program and data ROM 220 is included on chip. Most of this ROM space is allocated to data for outline graphics and fonts for specialty cameras. The program requirements are minor. The single most complex task is the encrypted authentication of the refill station. The ROM requires a single transistor per bit.

A Flash memory 221 may be used to store a 128 bit authentication code. This provides higher security than storage of the authentication code in ROM, as reverse engineering can be made essentially impossible. The Flash memory is completely covered by third level metal, making the data impossible to extract using scanning probe microscopes or electron beams. The authentication code is stored in the chip when manufactured. At least two other Flash bits are required for the authentication process: a bit which locks out reprogramming of the authentication code, and a bit which indicates that the camera has been refilled by an authenticated refill station. The flash memory can also be used to store FPN correction data for

the imaging array. Additionally, a phase locked loop rescaling parameter is stored is provided for scaling the clocking cycle to an appropriate correct time. The clock frequency does not require crystal accuracy since no date functions are provided. To eliminate the cost of a crystal, an on chip oscillator with a phase locked loop 124 is used. As the frequency of an on-chip oscillator is highly variable from chip to chip, the frequency ratio of the oscillator to the PLL is digitally trimmed during initial testing. The value is stored in Flash memory 121. This allows the clock PLL to control the ink-jet heater pulse width with sufficient accuracy.

A scratchpad SRAM is a small static RAM 222 with a 6T cell. The scratchpad provided temporary memory for the 16 bit CPU. 1024 bytes is adequate.

A print head interface 223 formats the data correctly for the print head. The print head interface also provides all of the timing signals required by the print head. These timing signals may vary depending upon temperature, the number of dots printed simultaneously, the print medium in the print roll, and the dye density of the ink in the print roll.

The following is a table of external connections to the print head interface:

Connection	Function	Pins
DataBits[0-7]	Independent serial data to the eight segments of the print head	8
BitClock	Main data clock for the print head	1
ColorEnable[0-2]	Independent enable signals for the CMY actuators, allowing different pulse times for each color.	3
BankEnable[0-1]	Allows either simultaneous or interleaved actuation of two banks of nozzles. This allows two different print speed/power consumption tradeoffs	2
NozzleSelect[0-4]	Selects one of 32 banks of nozzles for simultaneous actuation	5
ParallelXferClock	Loads the parallel transfer register with the data from the shift registers	1
Total		20

The print head utilized is composed of eight identical segments, each 1.25 cm long. There is no connection between the segments on the print head chip. Any connections required are made in the external TAB bonding film, which is double sided. The division into eight identical segments is to simplify lithography using wafer steppers. The segment width of 1.25 cm fits easily into a stepper field. As the print head chip is long and narrow (10 cm x 0.3 mm), the stepper field contains a single segment of 32 print head chips. The stepper field is therefore 1.25 cm x 1.6 cm. An average of four complete

print heads are patterned in each wafer step.

A single BitClock output line connects to all 8 segments on the print head. The 8 DataBits lines lead one to each segment, and are clocked in to the 8 segments on the print head simultaneously (on a BitClock pulse). For example, dot 0 is transferred to $segment_0$, dot 750 is transferred to $segment_1$, dot 1500 to $segment_2$ etc simultaneously.

The ParallelXferClock is connected to each of the 8 segments on the print head, so that on a single pulse, all segments transfer their bits at the same time.

The NozzleSelect, BankEnable and ColorEnable lines are connected to each of the 8 segments, allowing the print head interface to independently control the duration of the cyan, magenta, and yellow nozzle energizing pulses. Registers in the Print Head Interface allow the accurate specification of the pulse duration between 0 and 6 ms, with a typical duration of 2 ms to 3 ms.

A parallel interface 125 connects the ICP to individual static electrical signals. The CPU is able to control each of these connections as memory mapped I/O via a low speed bus.

The following is a table of connections to the parallel interface:

Connection	Direction	Pins
Paper transport stepper motor	Output	4
Capping solenoid	Output	1
Copy LED	Output	1
Photo button	Input	1
Copy button	Input	1
Total		8

A serial interface is also included to allow authentication of the refill station. This is included to ensure that the cameras are only refilled with paper and ink at authorized refill stations, thus preventing inferior quality refill industry from occurring. The camera must authenticate the refill station, rather than the other way around. The secure protocol is communicated to the refill station via a serial data connection. Contact can be made to four gold plated spots on the ICP/print head TAB by the refill station as the new ink is injected into the print head.

Seven high current drive transistors eg. 227 are required. Four are for the four phases of the main stepper motor two are for the guillotine motor, and the remaining transistor is to drive the capping solenoid. These transistors are allocated 20,000 square microns (600,000 F) each. As the transistors are driving highly inductive loads, they must either be turned off slowly, or be provided with a high level of back EMF protection. If adequate back EMF protection cannot be provided using the chip process chosen, then external discrete transistors should be used. The transistors are never driven at the same time as the image sensor is used. This is to avoid voltage fluctuations and hot spots affecting the image quality. Further, the transistors are located as far away from the sensor as possible.

A standard JTAG (Joint Test Action Group) interface 228 is included in the ICP for testing purposes and for interrogation by the refill station. Due to the complexity of the chip, a variety of testing techniques are required, including BIST (Built In Self Test) and functional block isolation. An overhead of 10% in chip area is assumed for chip testing circuitry for the random logic portions. The overhead for the large arrays the image sensor and the DRAM) is smaller.

The JTAG interface is also used for authentication of

the refill station. This is included to ensure that the cameras are only refilled with quality paper and ink at a properly constructed refill station, thus preventing inferior quality refills from occurring. The camera must authenticate the refill station, rather than vice versa. The secure protocol is communicated to the refill station during the automated test procedure. Contact is made to four gold plated spots on the ICP/print head TAB by the refill station as the new ink is injected into the print head.

Fig. 16 illustrates rear view of the next step in the construction process whilst Fig. 17 illustrates a front camera view.

Turning now to Fig. 16, the assembly of the camera system proceeds via first assembling the ink supply mechanism 40. The flex PCB is interconnected with batteries only one 84 of which is shown, which are inserted in the middle portion of a print roll 85 which is wrapped around a plastic former 86. An end cap 89 is provided at the other end of the print roll 85 so as to fasten the print roll and batteries firmly to the ink supply mechanism.

The solenoid coil is interconnected (not shown) to interconnects 97, 98 (Fig. 8) which include leaf spring ends for interconnection with electrical contacts on the Flex PCB so as to provide for electrical control of the solenoid.

Turning now to Figs. 17 - 19 the next step in the construction process is the insertion of the relevant gear chains into the side of the camera chassis. Fig. 17 illustrates a front camera view, Fig. 18 illustrates a back side view and Fig. 19 also illustrates a back side view. The first gear chain comprising gear wheels 22, 23 are utilised for driving the guillotine blade with the gear wheel 23 engaging the gear wheel 65 of Fig. 8. The second gear chain comprising gear wheels 24, 25 and 26 engage one end of the print roller 61 of Fig. 8. As best indicated in Fig. 18, the gear wheels mate with corresponding buttons on

the surface of the chassis with the gear wheel 26 being snap fitted into corresponding mating hole 27.

Next, as illustrated in Fig. 20, the assembled platten unit is then inserted between the print roll 85 and aluminium cutting blade 43.

Turning now to Fig. 21, by way of illumination, there is illustrated the electrically interactive components of the camera system. As noted previously, the components are based around a Flex PCB board and include a TAB film 58 which interconnects the printhead 102 with the image sensor and processing chip 51. Power is supplied by two AA type batteries 83, 84 and a paper drive stepper motor 16 is provided in addition to a rotary guillotine motor 20.

An optical element 31 is provided for snapping into a top portion of the chassis 12. The optical element 31 includes portions defining an optical view finder 32, 33 which are slotted into mating portions 35, 36 in view finder channel 37. Also provided in the optical element 31 is a lensing system 38 for magnification of the prints left number in addition to an optical pipe element 39 for piping light from the LED 5 for external display.

Turning next to Fig. 22, the assembled unit 90 is then inserted into a front outer case 91 which includes button 4 for activation of printouts.

Turning now to Fig. 23, next, the unit 92 is provided with a snap-on back cover 93 which includes a slot 6 and copy print button 7. A wrapper label containing instructions and advertising (not shown) is then wrapped around the outer surface of the camera system and pinch clamped to the cover by means of clamp strip 96 which can comprise a flexible plastic or rubber strip.

Subsequently, the preferred embodiment is ready for use as a one time use camera system that provides for instant output images on demand. It will be evident that the preferred embodiment further provides for a refillable camera system. A used camera can be collected and its outer

plastic cases removed and recycled. A new paper roll and batteries can be added and the ink cartridge refilled. A series of automatic test routines can then be carried out to ensure that the printer is properly operational. Further, in order to ensure only authorised refills are conducted so as to enhance quality, routines in the on-chip program ROM can be executed such that the camera authenticates the refilling station using a secure protocol. Upon authentication, the camera can reset an internal paper count and an external case can be fitted on the camera system with a new outer label. Subsequent packing and shipping can then take place.

It will be further readily evident to those skilled in the art that the program ROM can be modified so as to allow for a variety of digital processing routines. In addition to the digitally enhanced photographs optimised for mainstream consumer preferences, various other models can readily be provided through mere re-programming of the program ROM. For example, a sepia classic old fashion style output can be provided through a remapping of the colour mapping function. A further alternative is to provide for black and white outputs again through a suitable colour remapping algorithm. Minimumless colour can also be provided to add a touch of colour to black and white prints to produce the effect that was traditionally used to colourize black and white photos. Further, passport photo output can be provided through suitable address remappings within the address generators. Further, edge filters can be utilised as is known in the field of image processing to produce sketched art styles. Further, classic wedding borders and designs can be placed around an output image in addition to the provision of relevant clip arts. For example, a wedding style camera might be provided. Further, a panoramic mode can be provided so as to output the well known panoramic format of images. Further, a postcard style output can be provided through the printing of postcards

including postage on the back of a print roll surface. Further, cliparts can be provided for special events such as Halloween, Christmas etc. Further, kleidoscopic effects can be provided through address remappings and wild colour effects can be provided through remapping of the colour lookup table. Many other forms of special event cameras can be provided for example, cameras dedicated to the Olympics, movie tie-ins, advertising and other special events.

The operational mode of the camera can be programmed so that upon the depressing of the take photo a first image is sampled by the sensor array to determine irrelevant parameters. Next a second image is again captured which is utilised for the output. The captured image is then manipulated in accordance with any special requirements before being initially output on the paper roll. The LED light is then activated for a predetermined time during which the DRAM is refreshed so as to retain the image. If the print copy button is depressed during this predetermined time interval, a further copy of the photo is output. After the predetermined time interval where no use of the camera has occurred, the onboard CPU shuts down all power to the camera system until such time as the take button is again activated. In this way, substantial power savings can be realized.

It would be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects to be illustrative and not restrictive.

The present provisional is one of a series of Australian Provisional Patent Applications which relate to a new form of technology for the production of images. These Australian Provisional Patent Applications encompass a broad range of fields and as such, the present provisional is best

viewed in the overall context of the development of this new form of technology. Appendix A attached hereto sets out the details of each of the series of Australian Provisional Patent Applications and, to the extent necessary, the associated Australian Provisional Patent Applications are hereby incorporated by cross-reference.

We Claim:

1. In a camera system comprising:

an image sensor device for sensing an image;

a processing means for processing said sensed image;

a print media supply means for the supply of print media to a print head;

a print head for printing said sensed image on said print media stored internally to said camera system;

a portable power supply interconnected to said print head, said sensor and said processing means; and

a guillotine mechanism located between said print media supply means and said print head and adapted to cut said print media into sheets of a predetermined size.

2. A method as claimed in claim 3 wherein said guillotine mechanism is detachable from said camera system.

3. A method as claimed in claim 4 wherein said guillotine mechanism is attached to said print media supply means and is detachable from said camera system with said print media supply means.

4. A method as claimed in claim 1 wherein said guillotine mechanism is mounted on a platten unit below said print head.

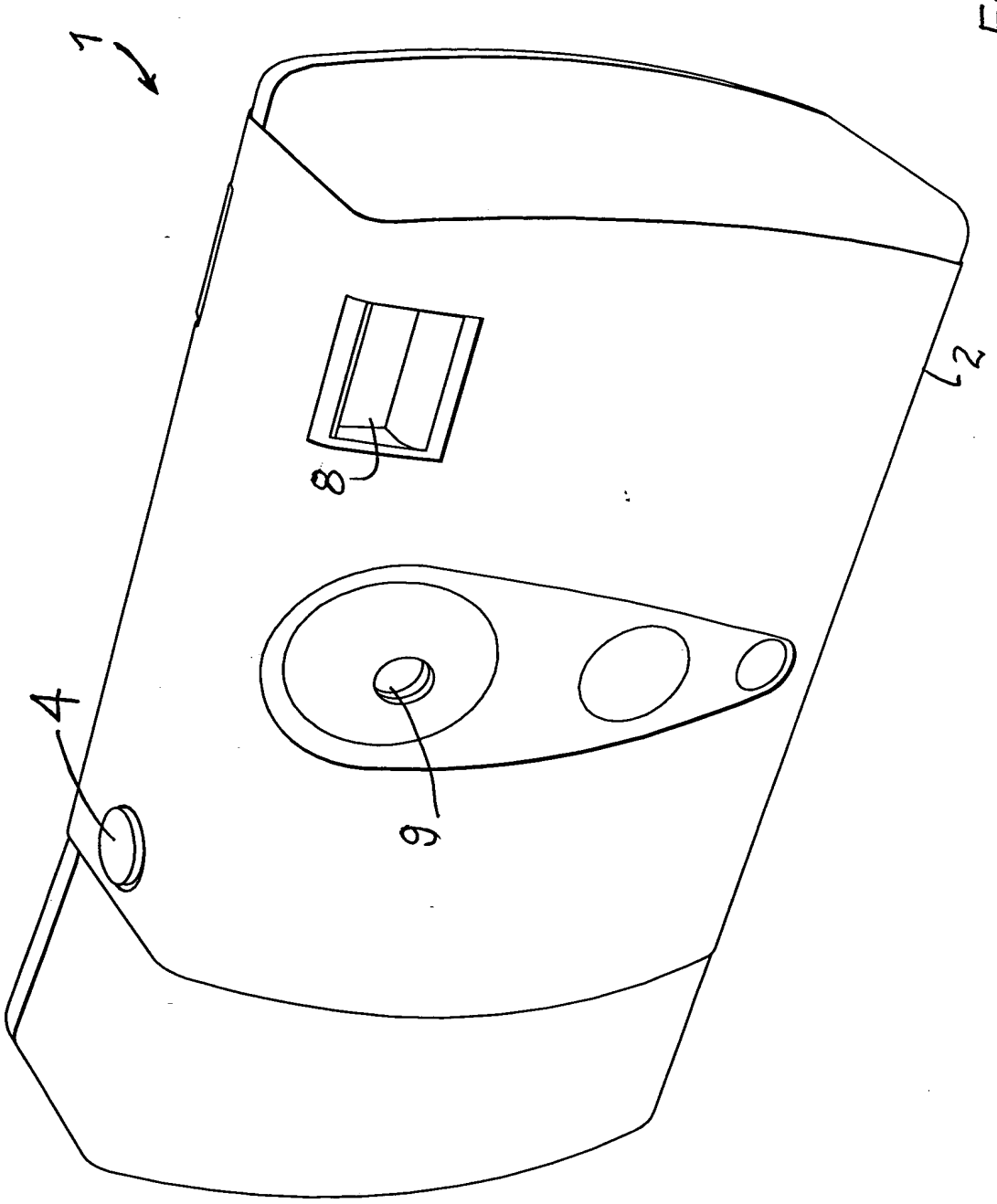
Dated this 12th day of December 1997

Silverbrook Research Pty Limited

By their Patent Attorneys

GRIFFITH HACK

Fig. 1



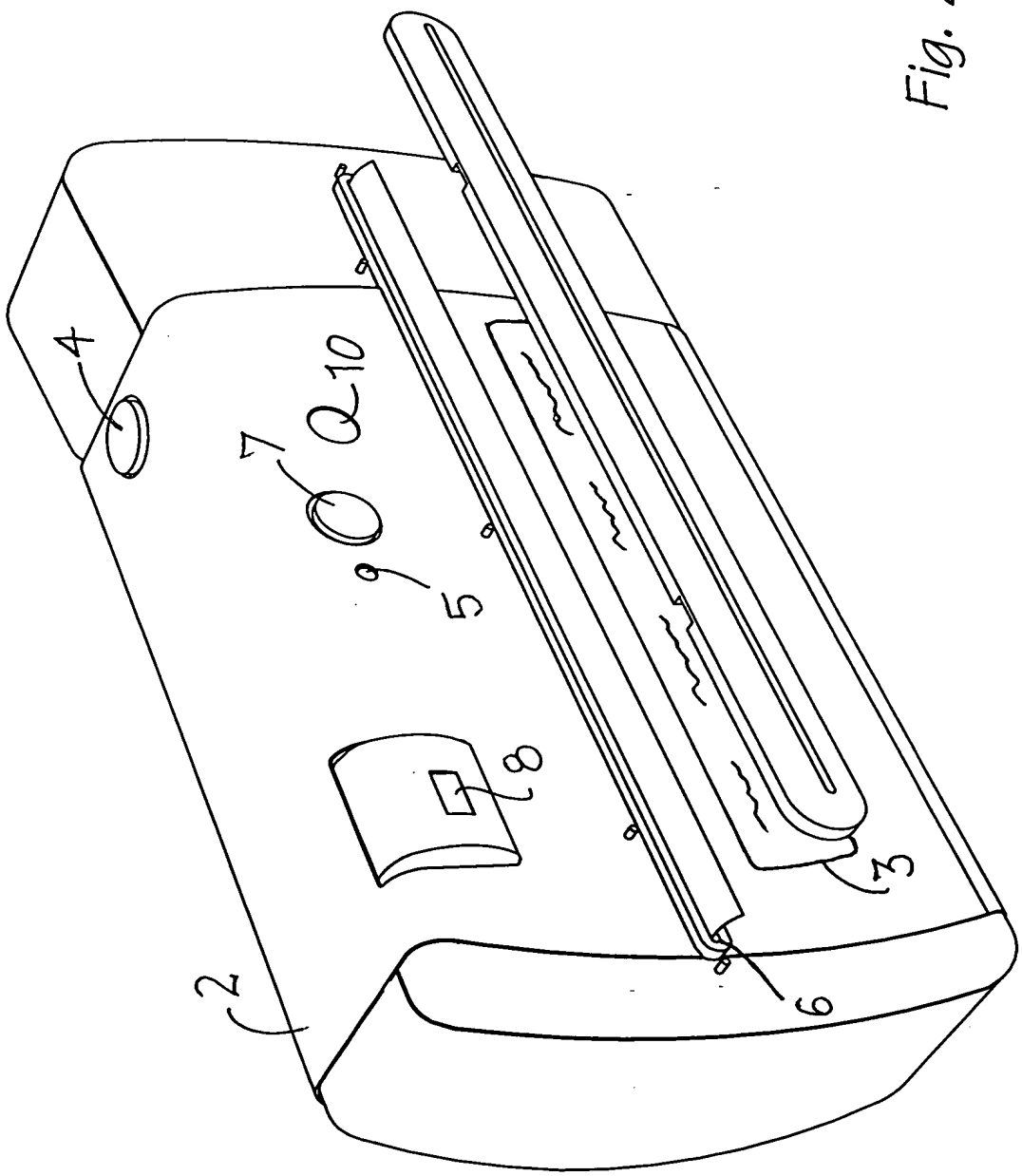


Fig. 2

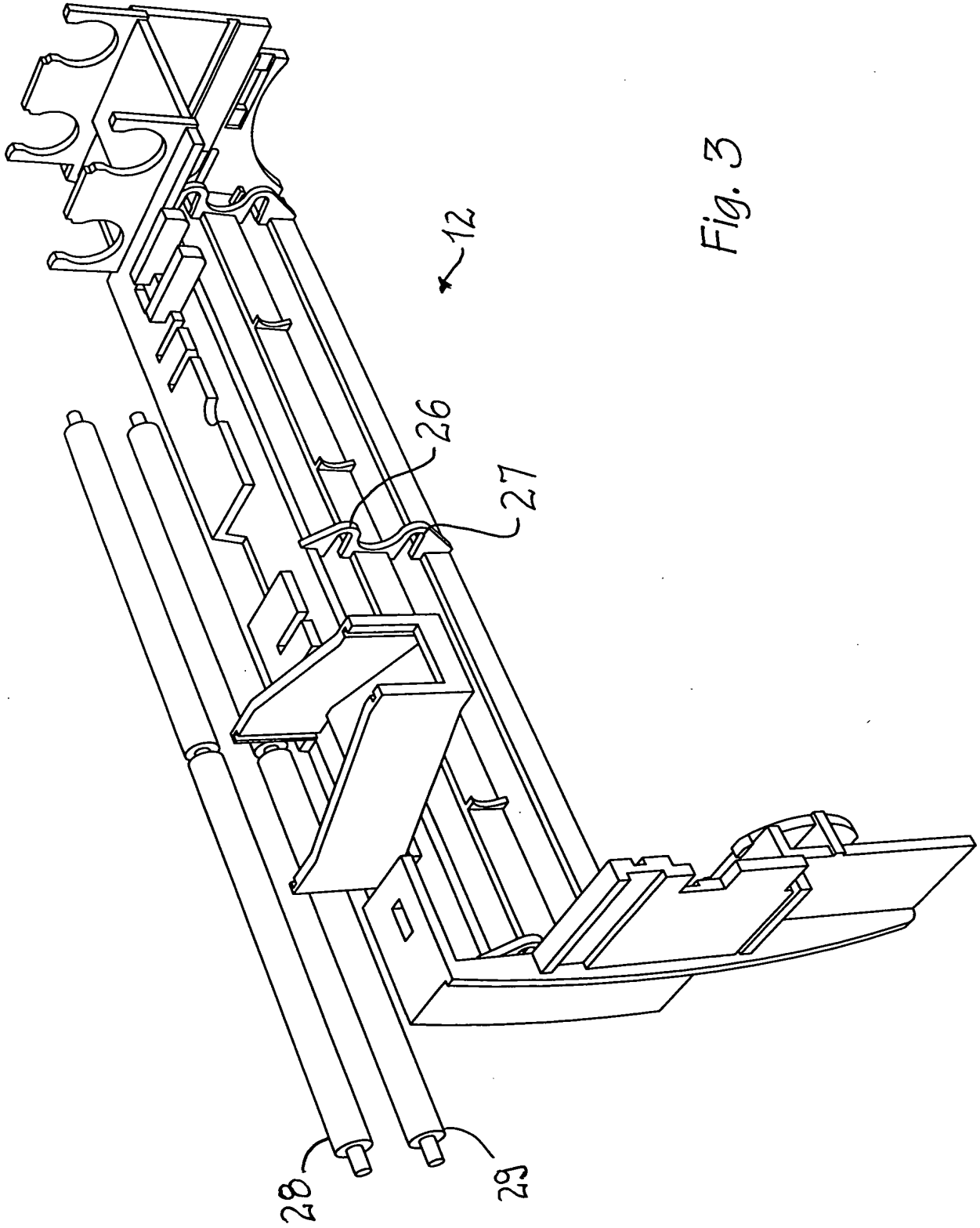


Fig. 3

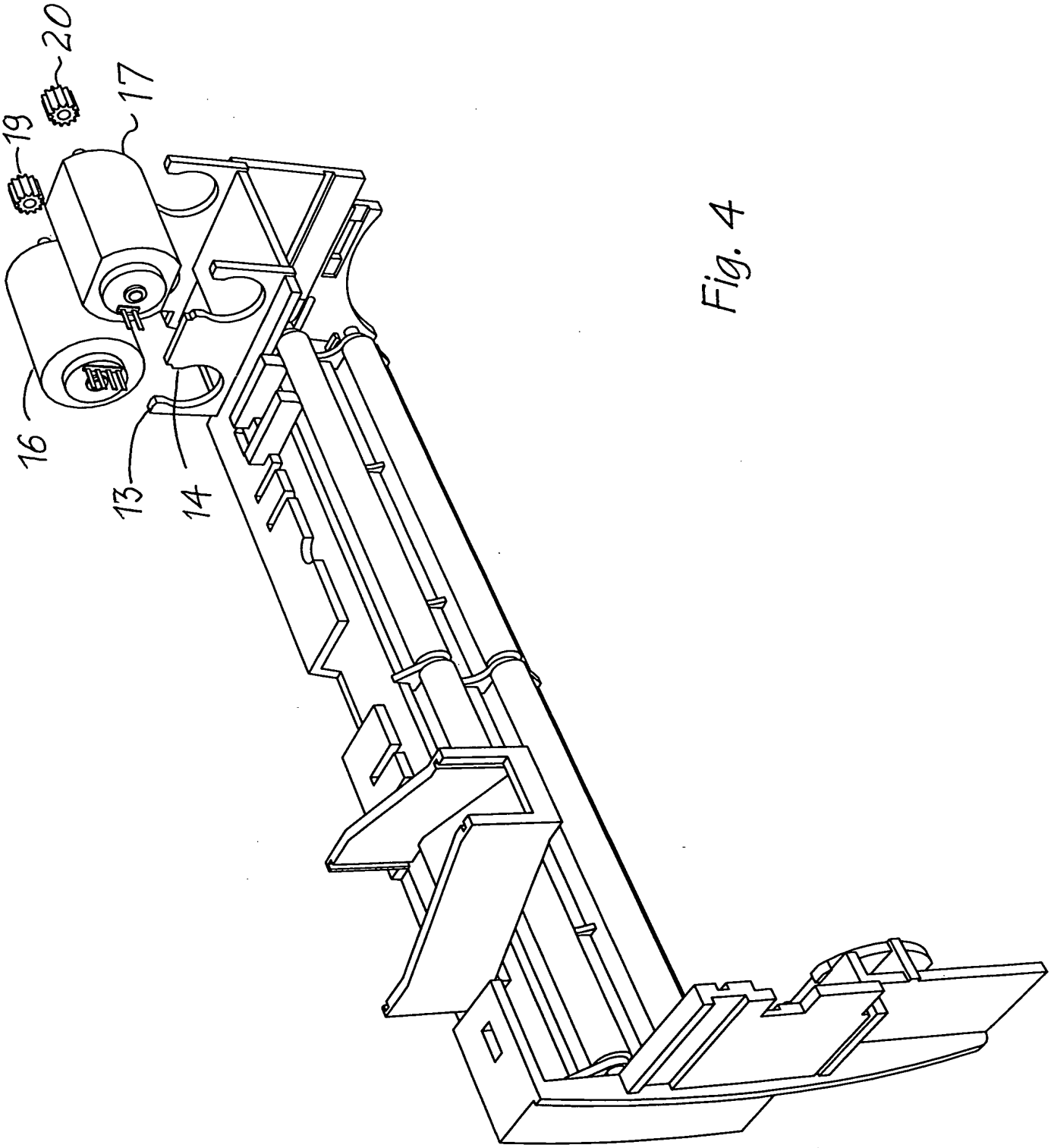


Fig. 4

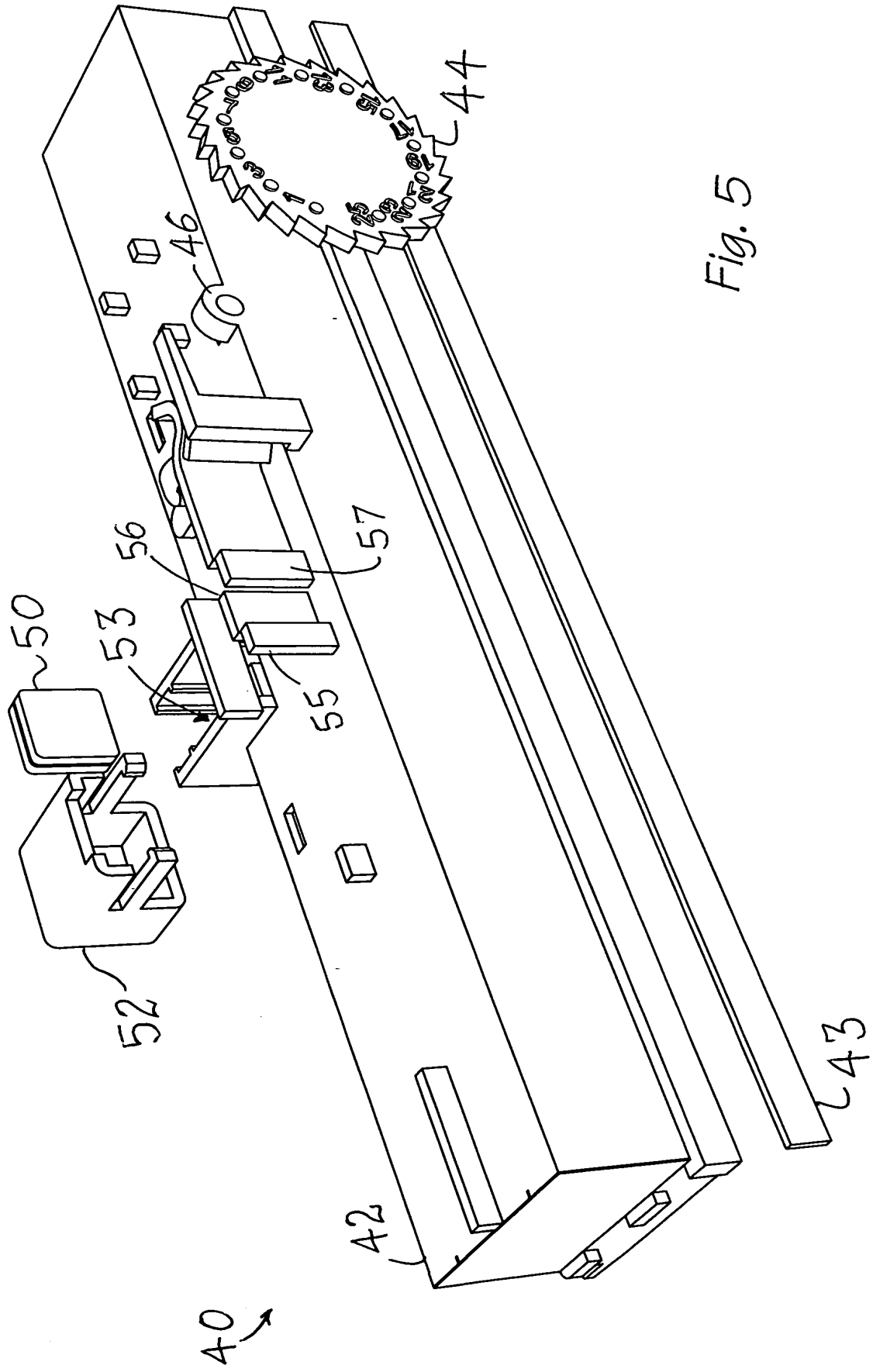


Fig. 5

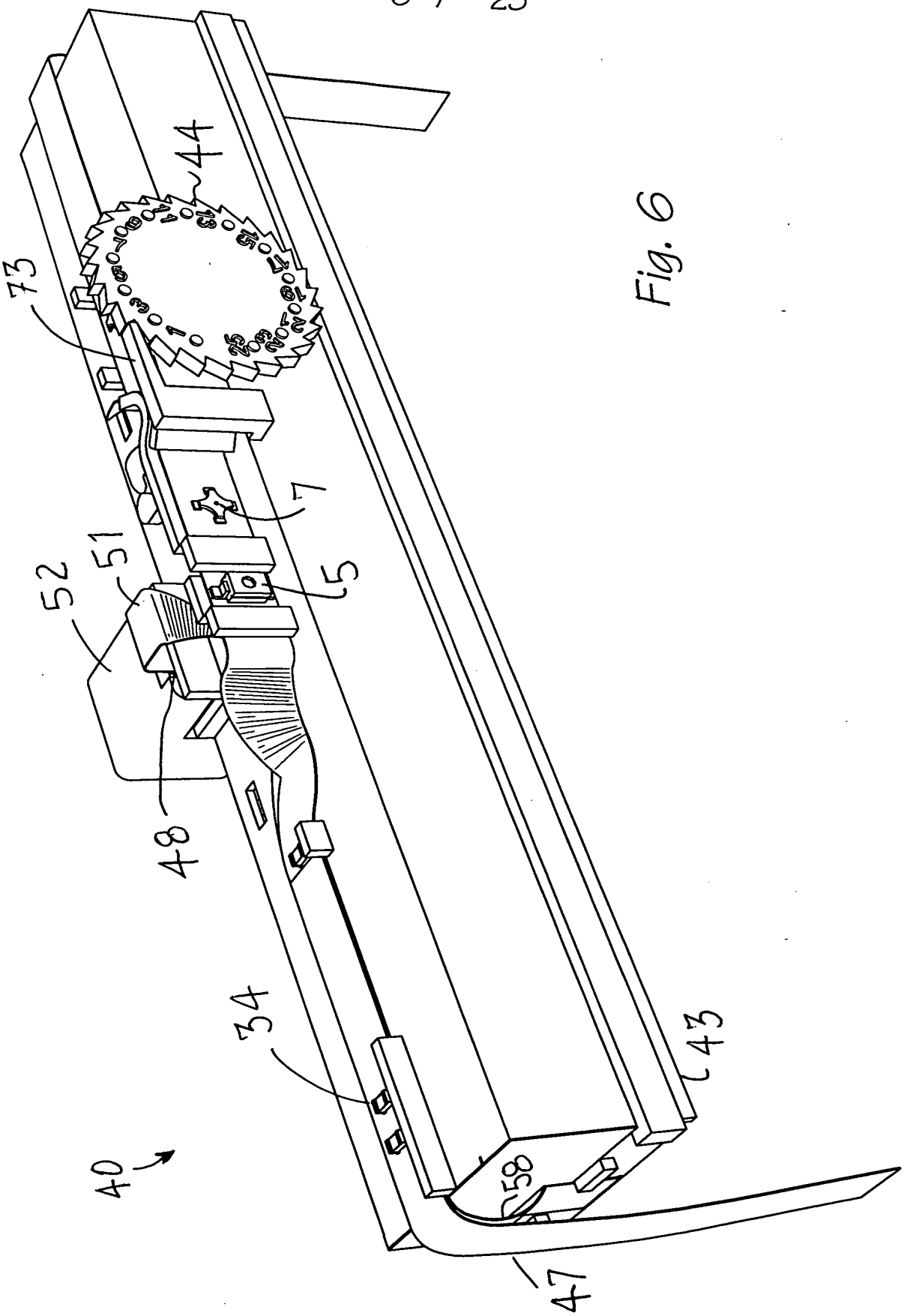


Fig. 6

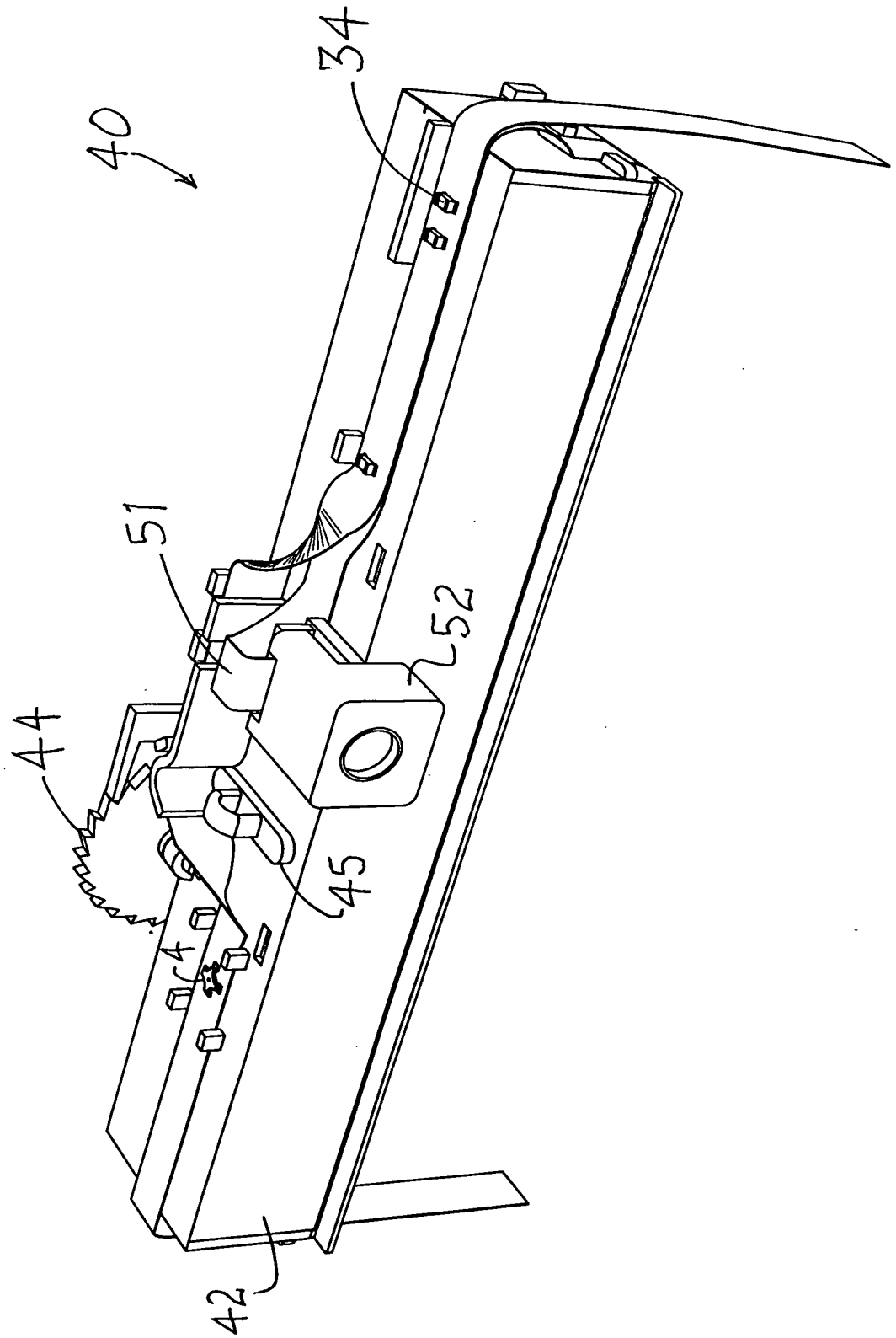


Fig. 7

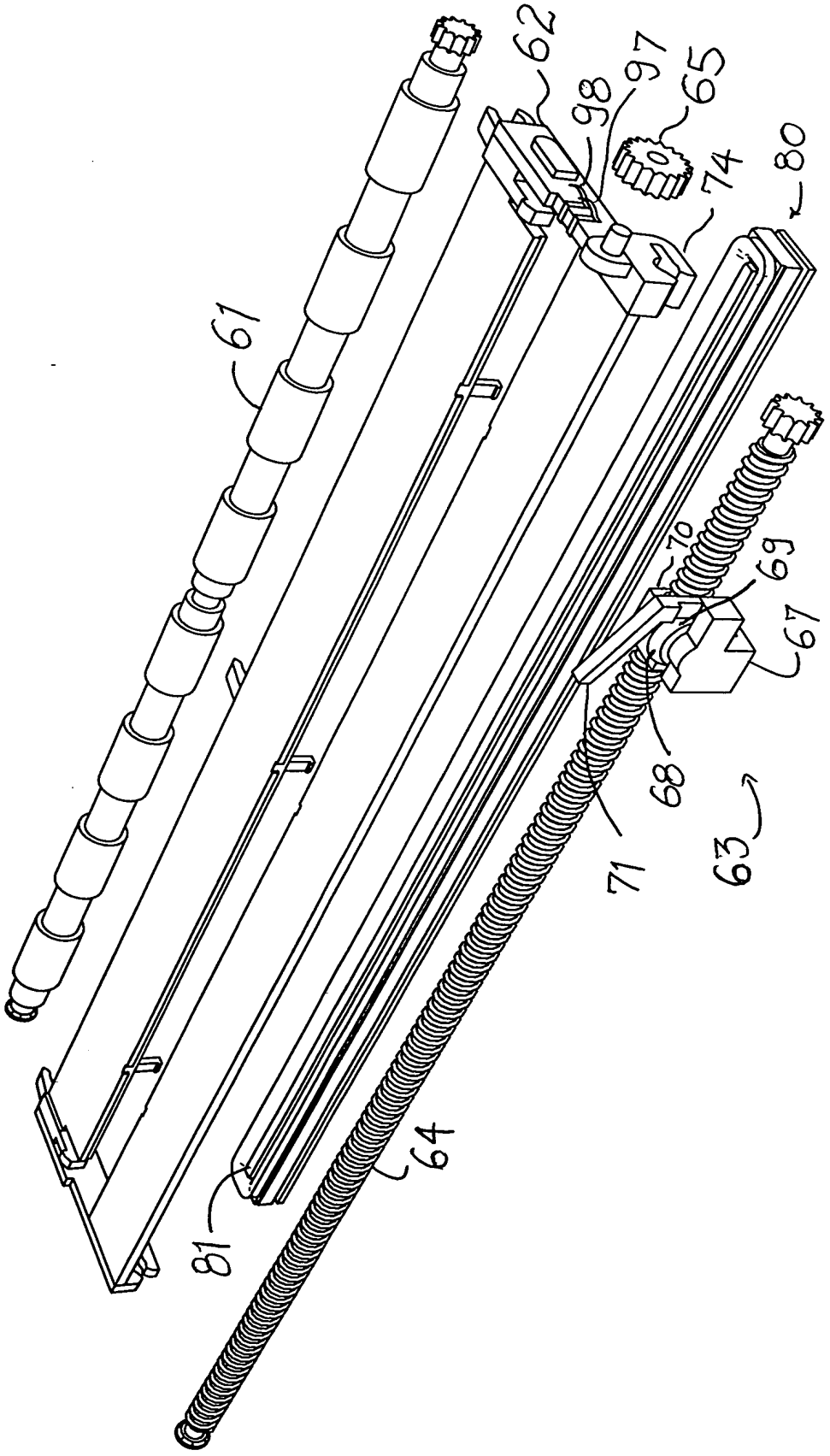


Fig. 8

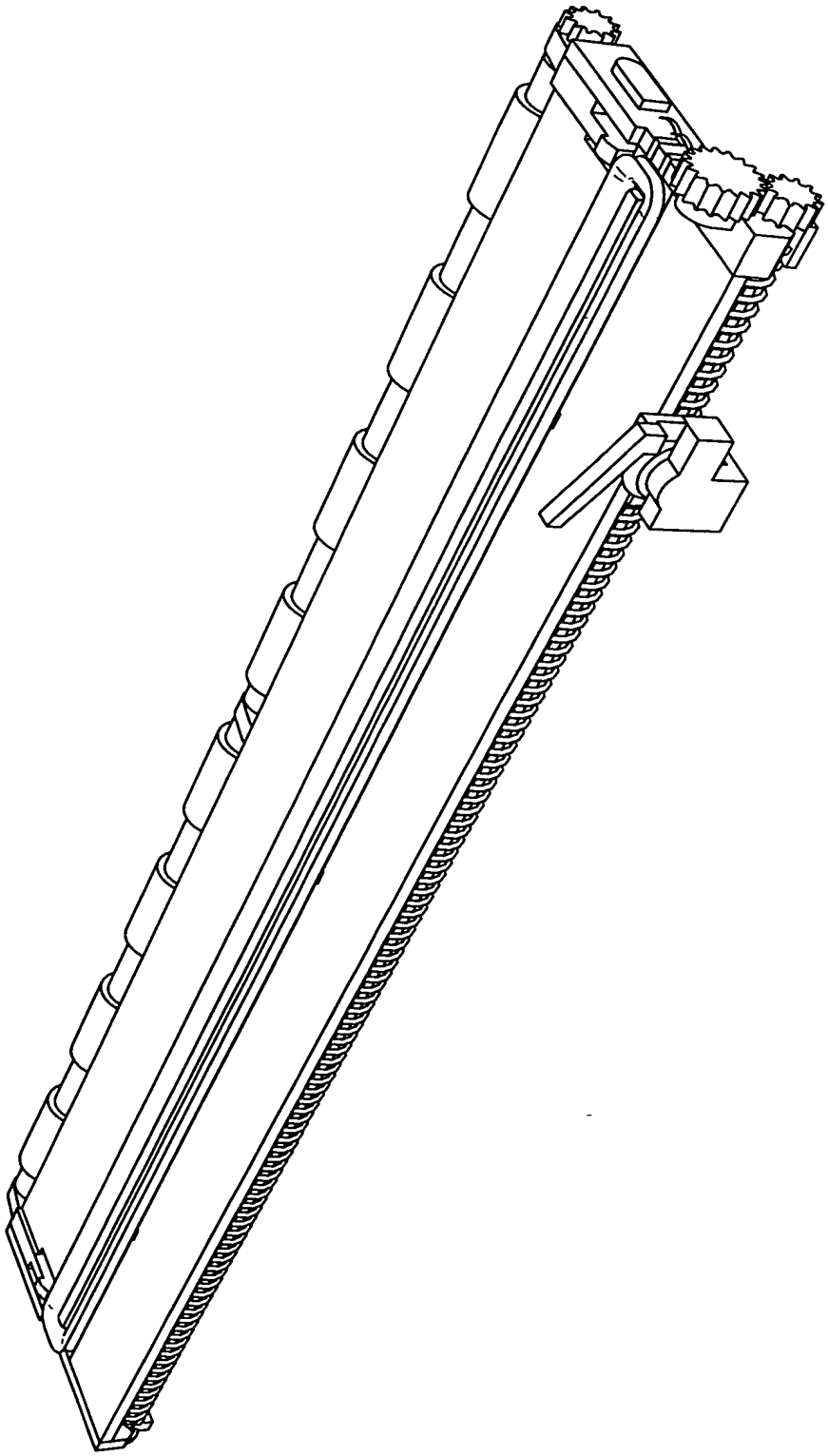


Fig. 9

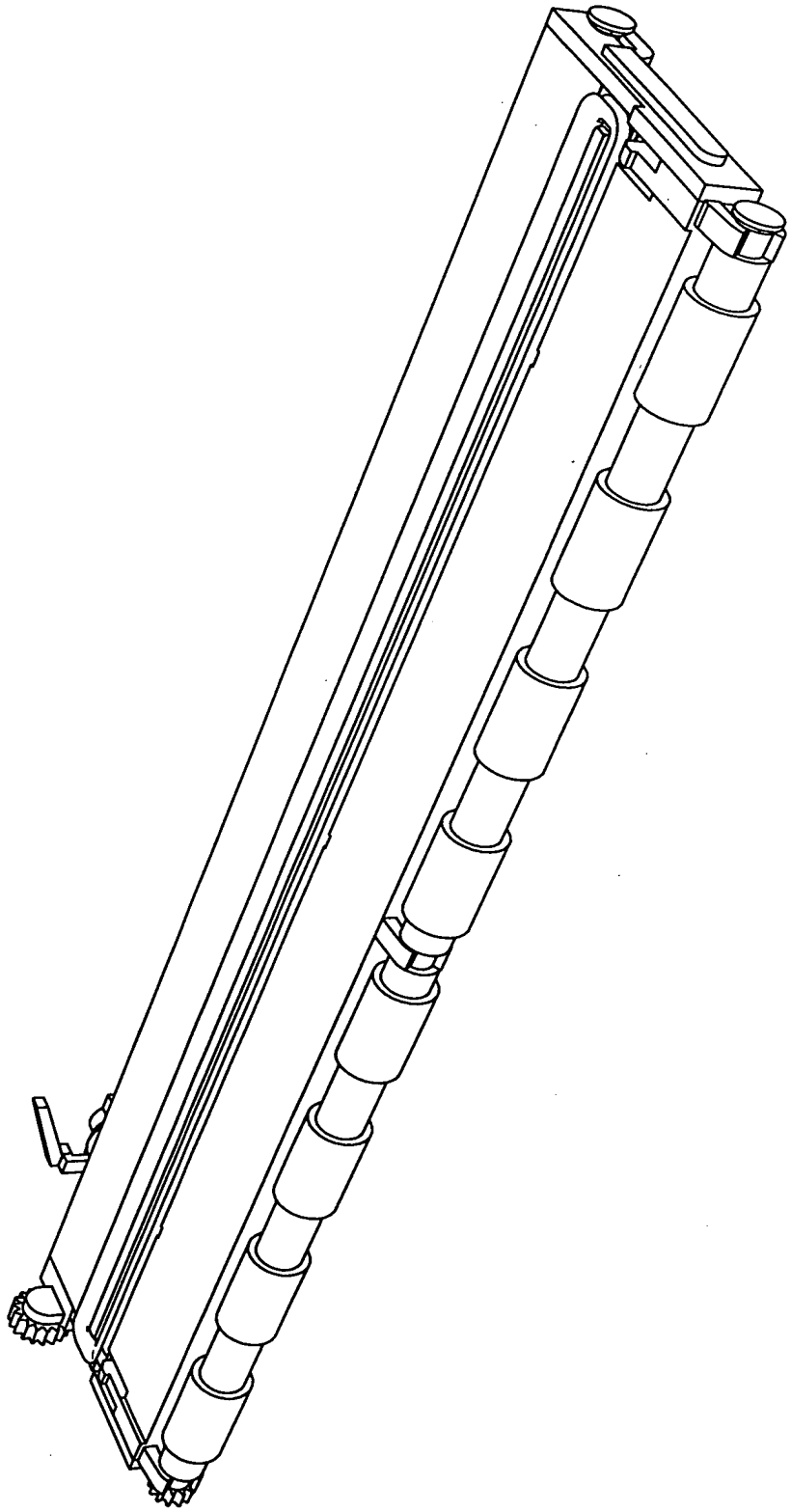


Fig. 10

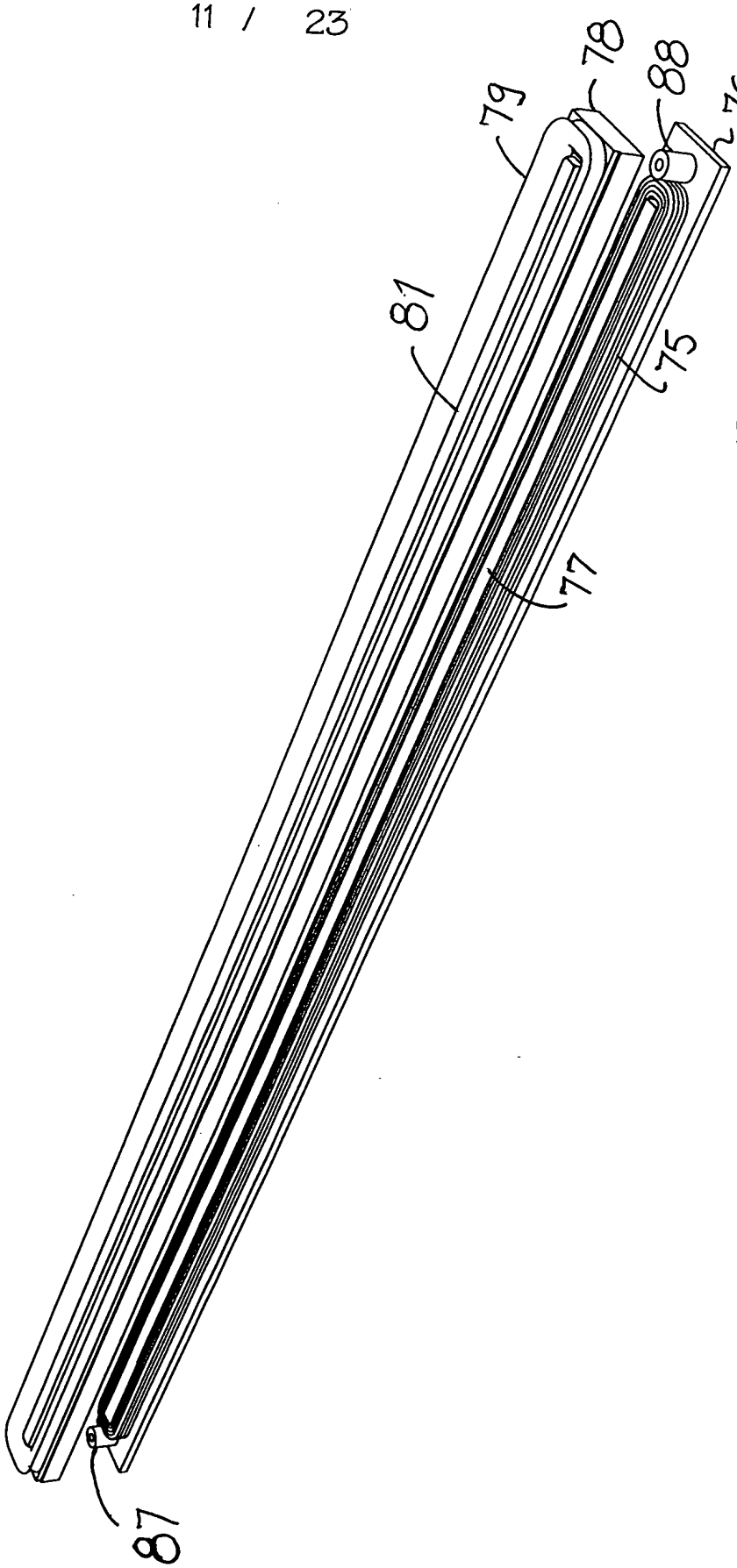


Fig. 11

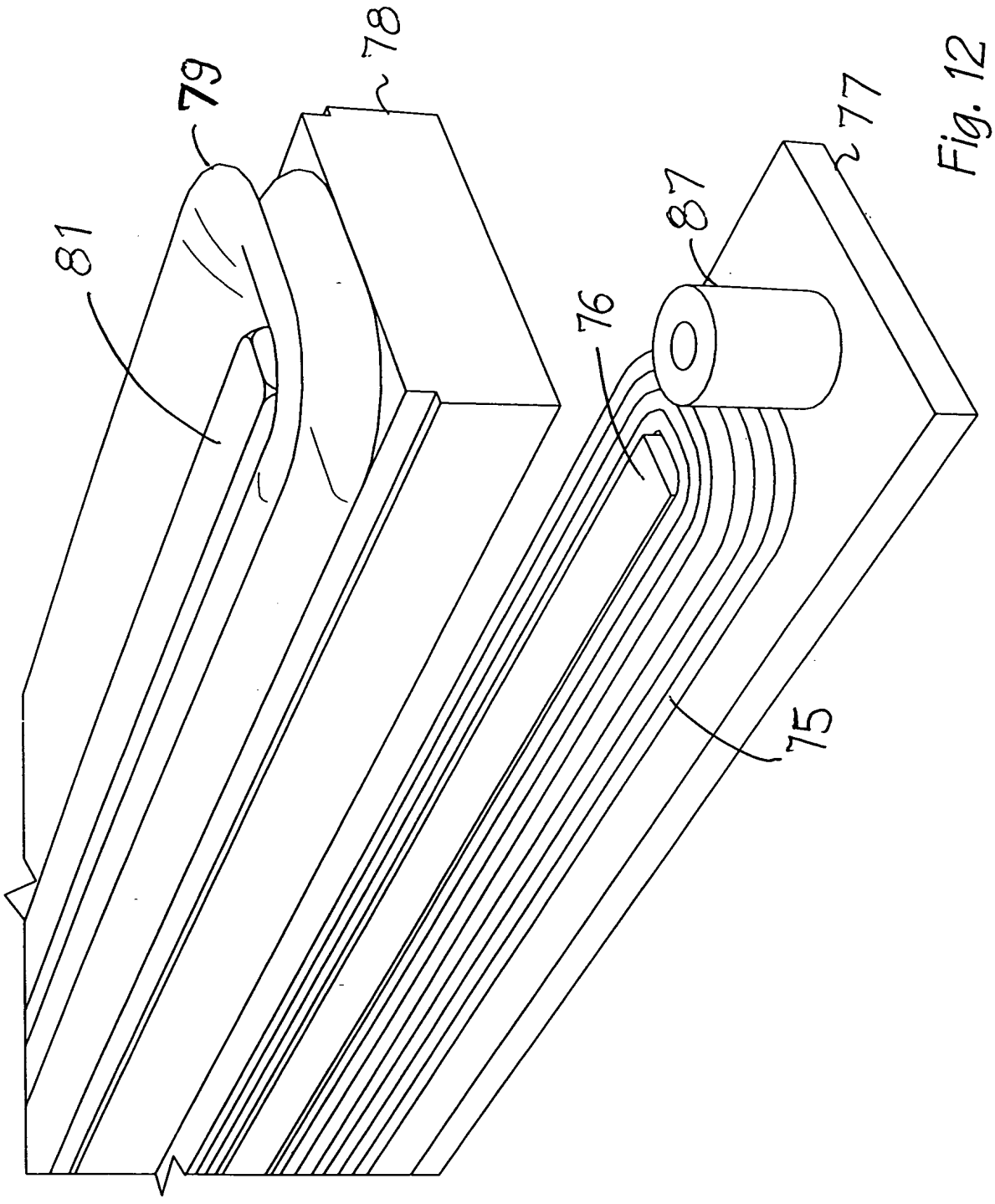


Fig. 12

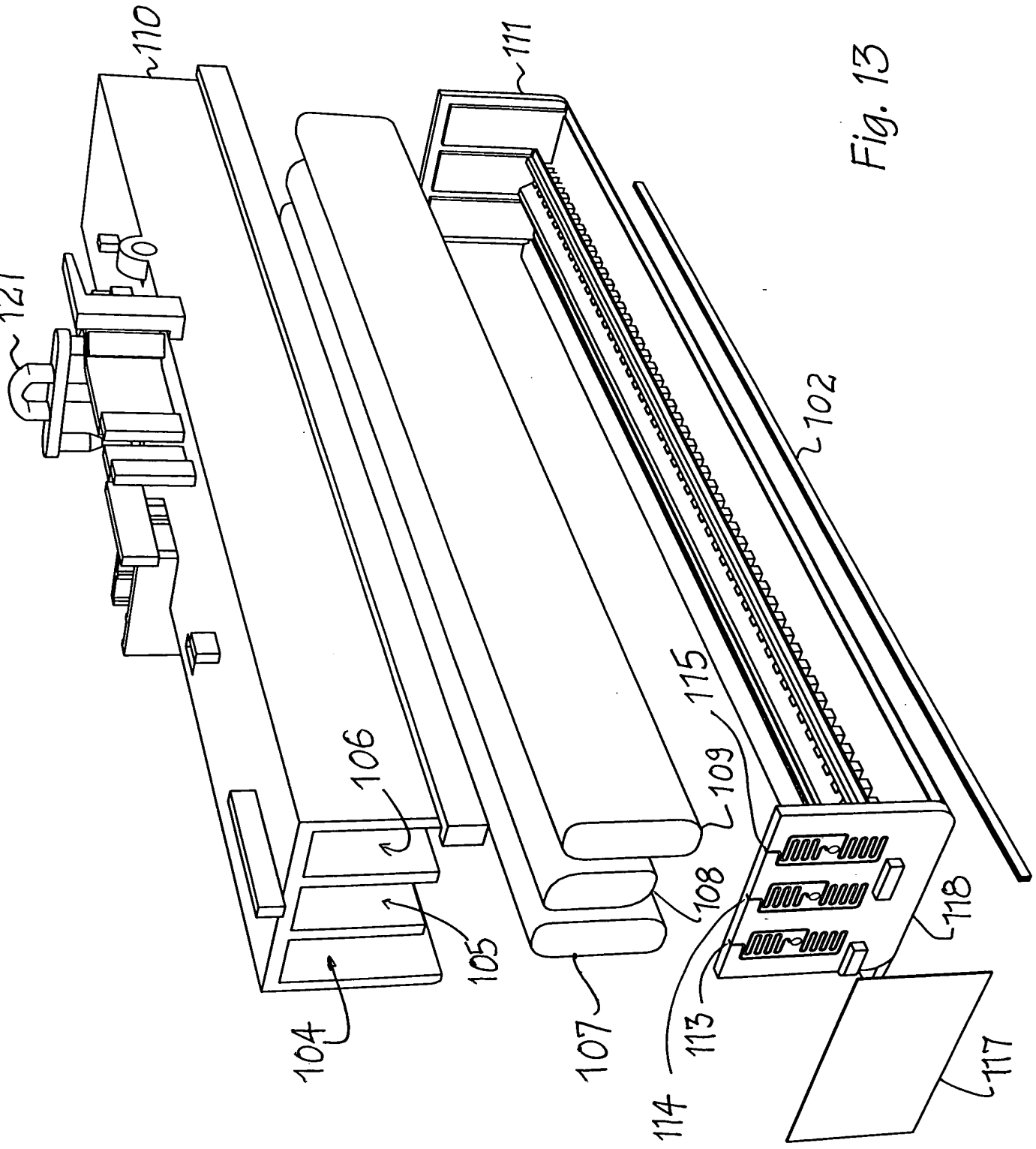


Fig. 13

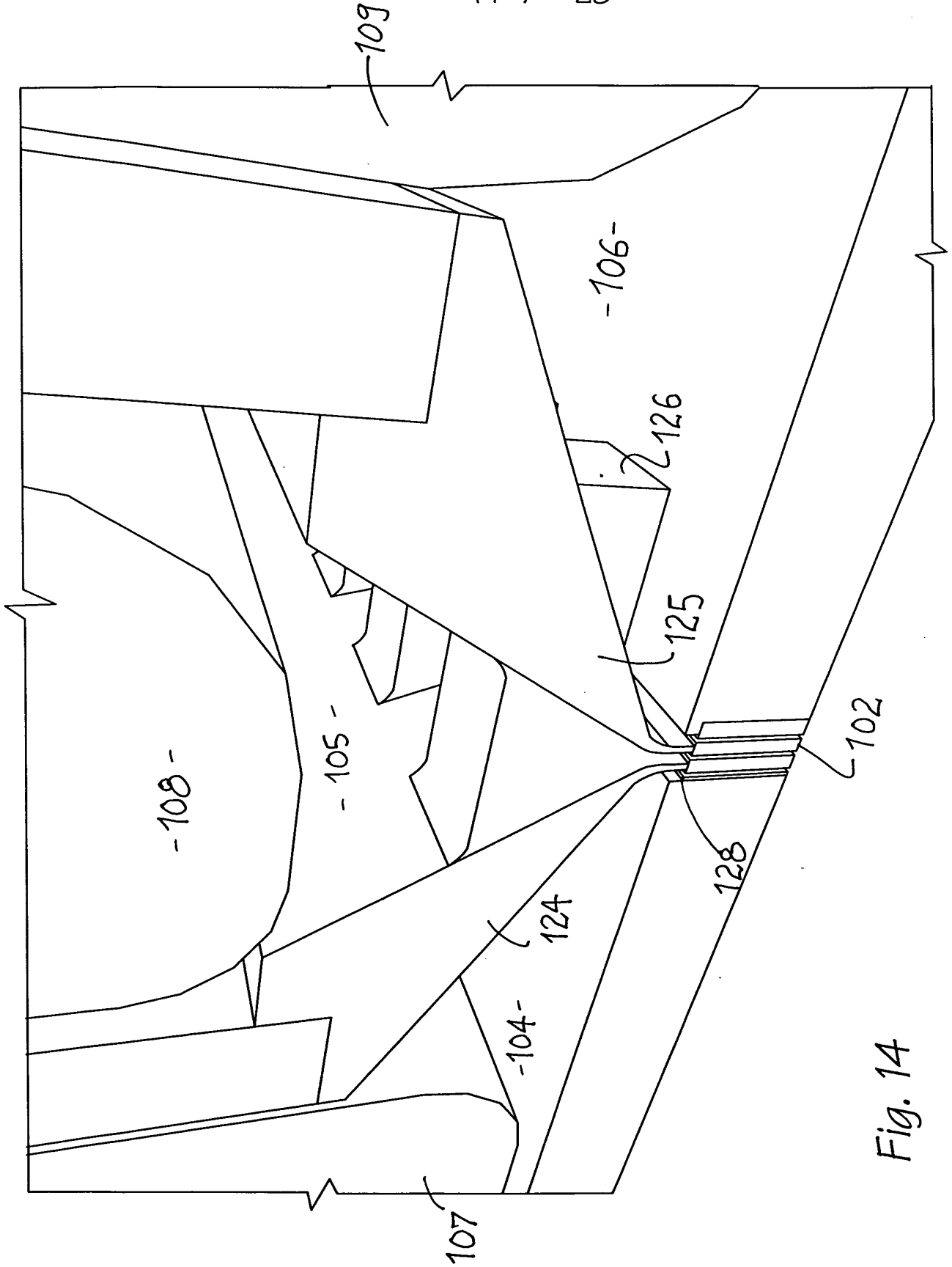
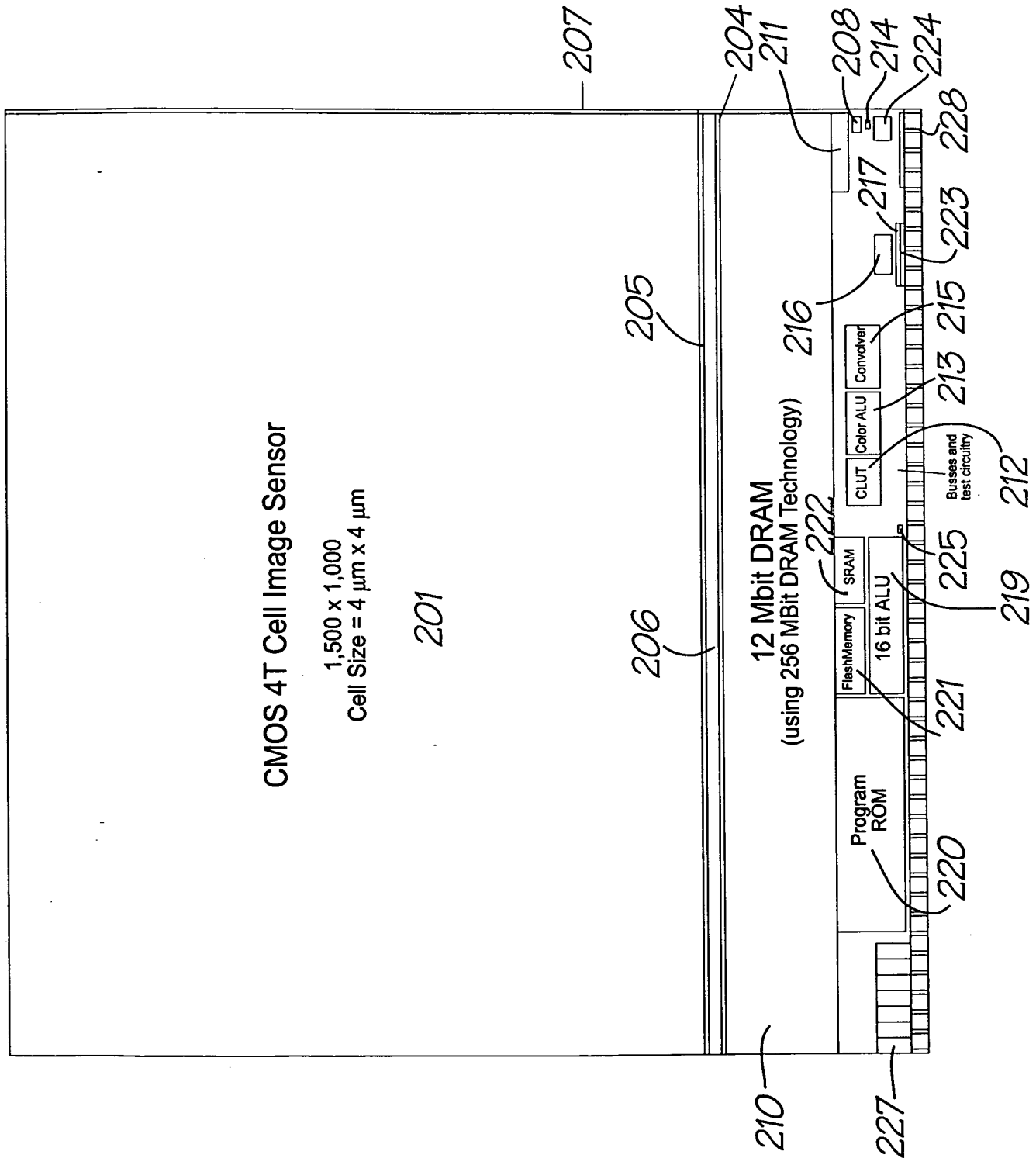


Fig. 14


CMOS 4T Cell Image Sensor
1,500 x 1,000
Cell Size = 4 µm x 4 µm
201
12 Mbit DRAM
(using 256 MBit DRAM Technology)
Program ROM
FlashMemory
SRAM
16 bit ALU
CLUT
Color ALU
Convolver
Busses and test circuitry
207
204
211
208
214
224
228
217
223
216
215
205
213
212
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227

Fig. 15

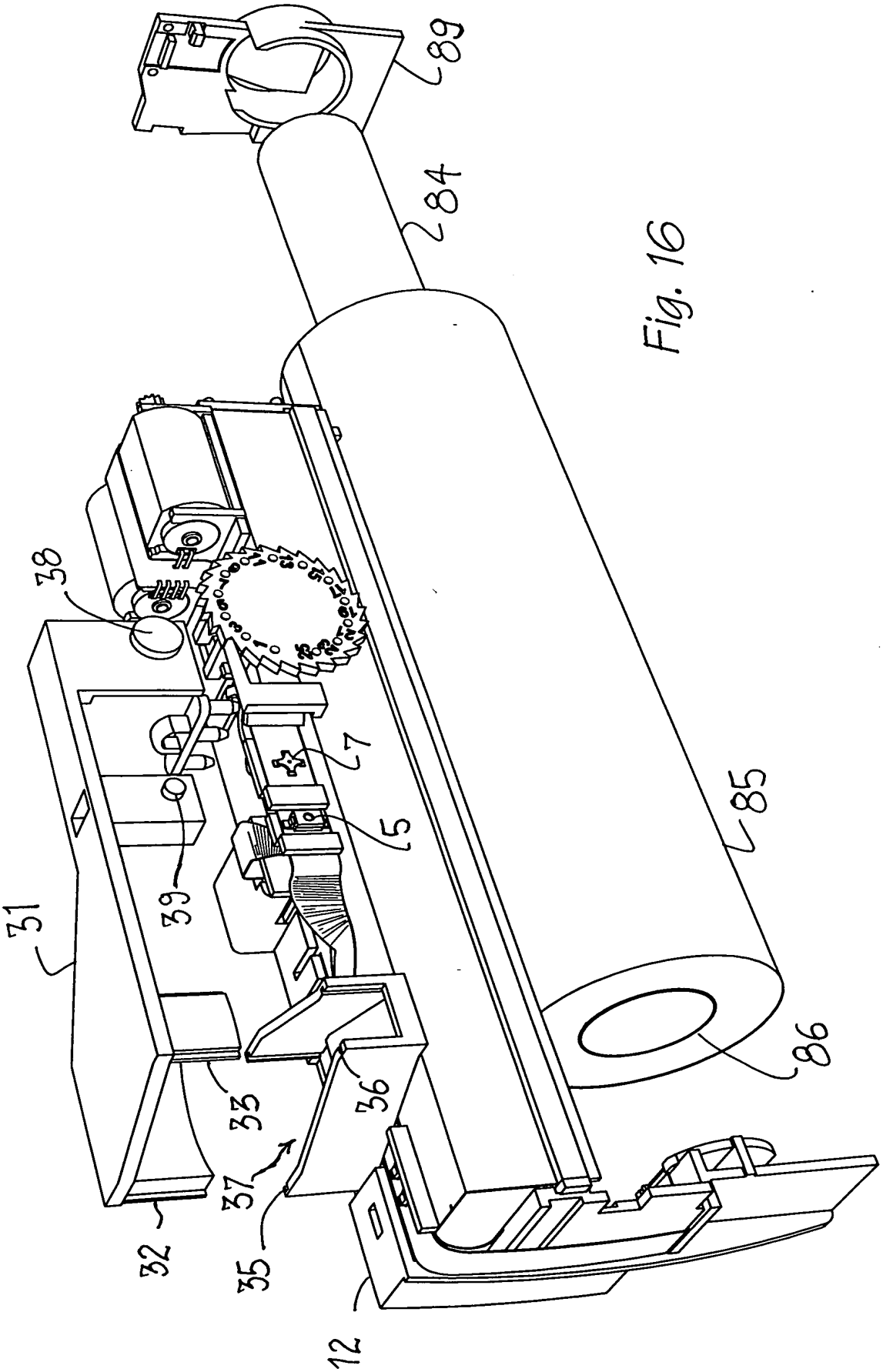

Fig. 16

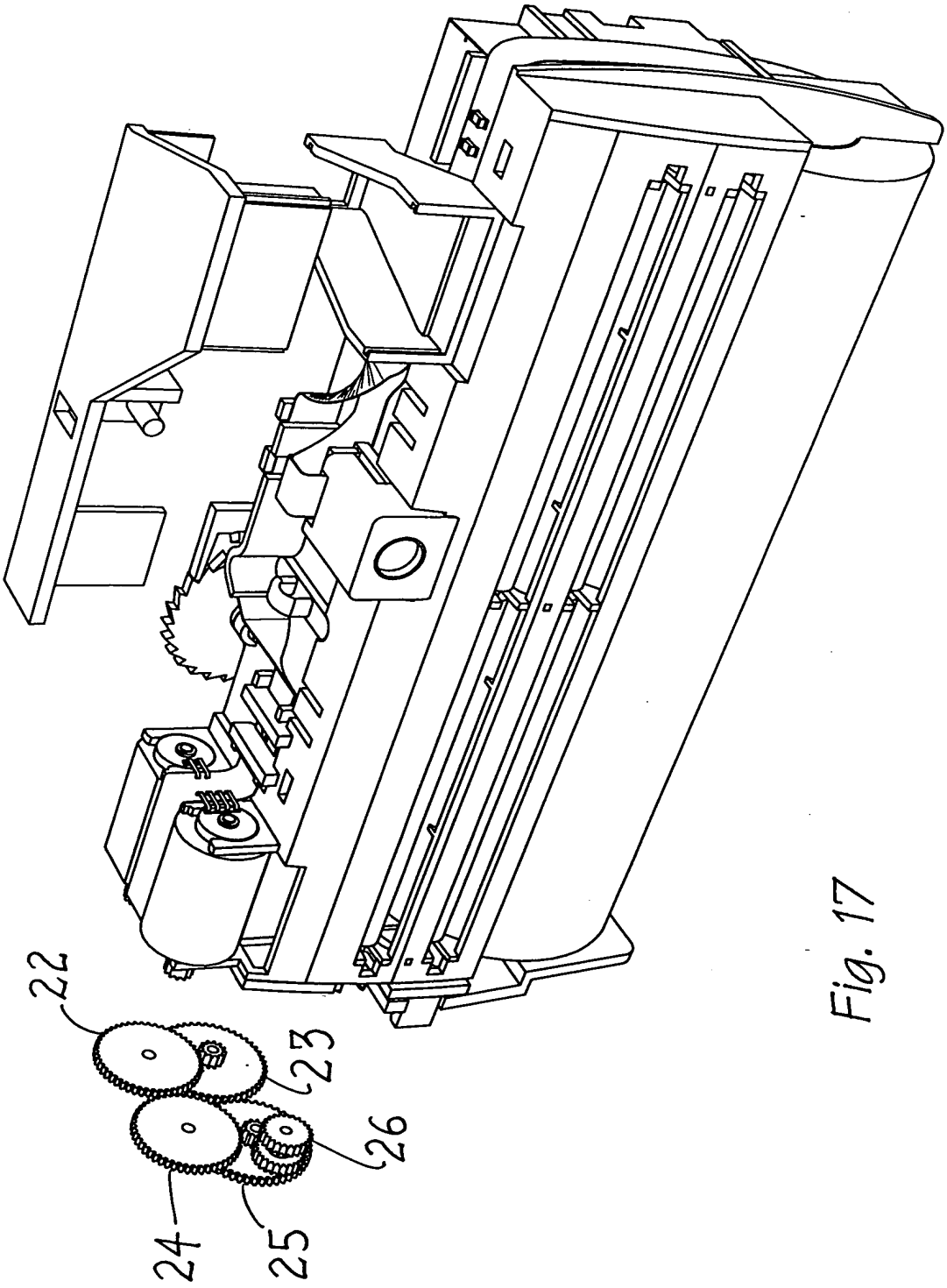

Fig. 17

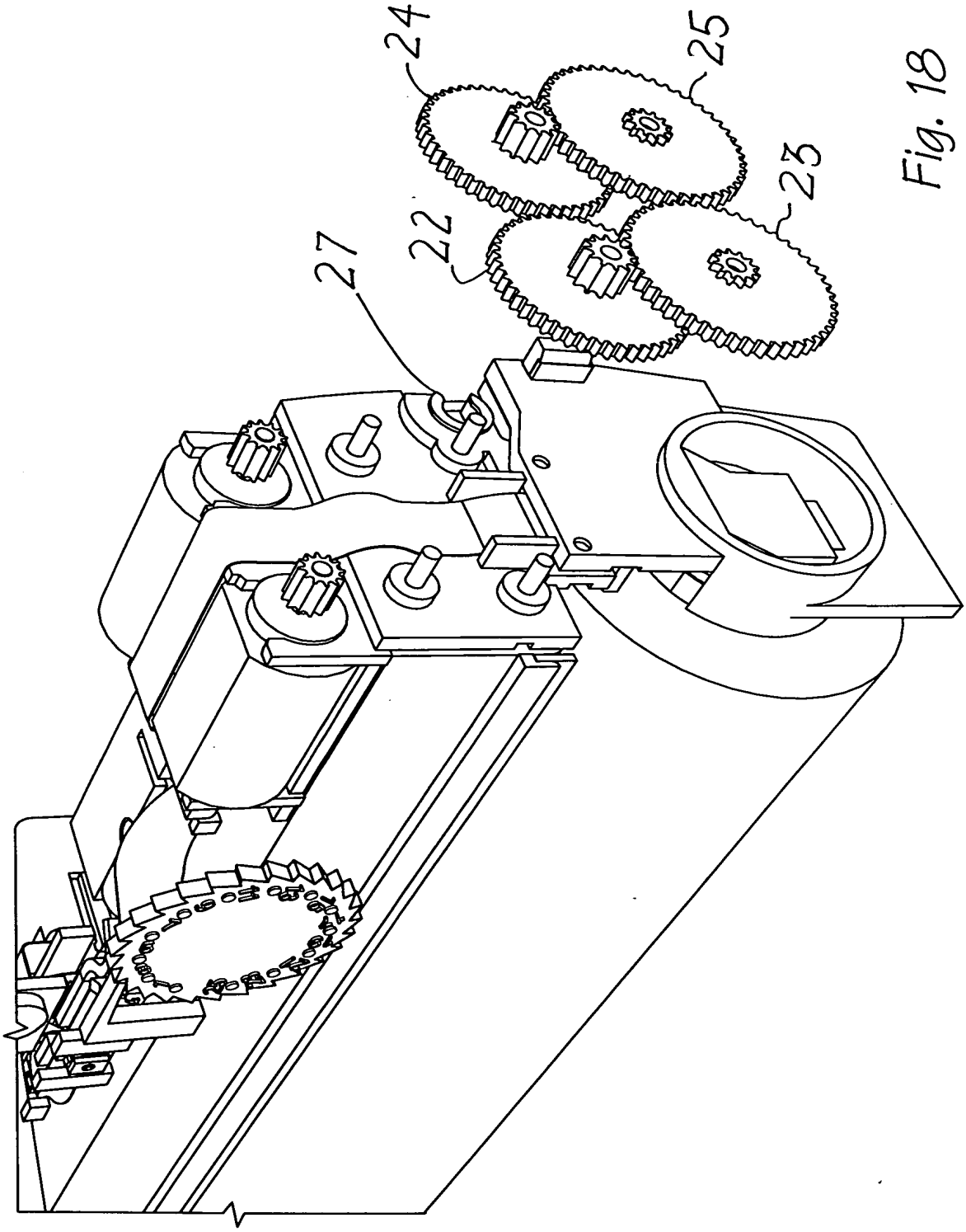

Fig. 18

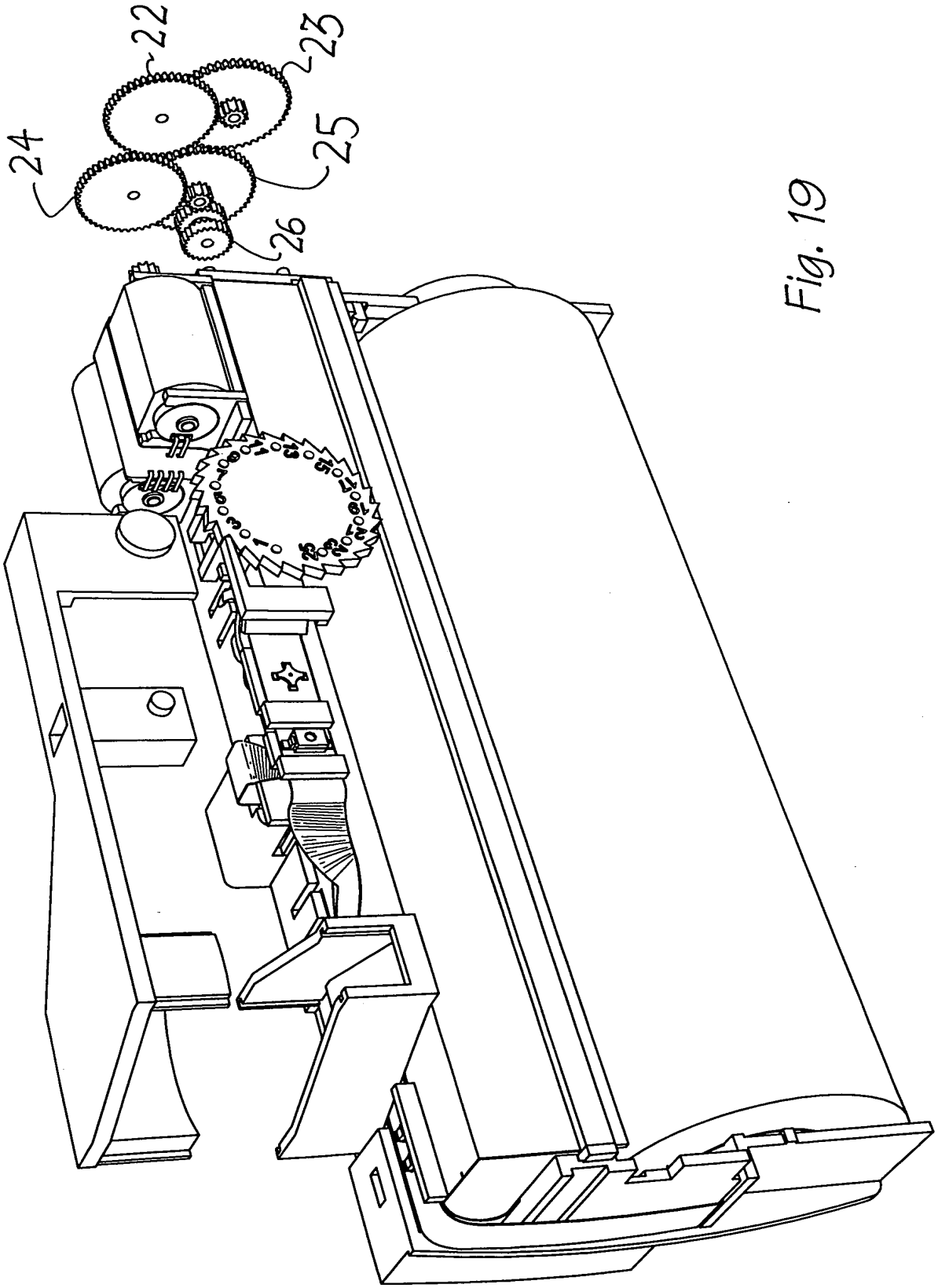

Fig. 19

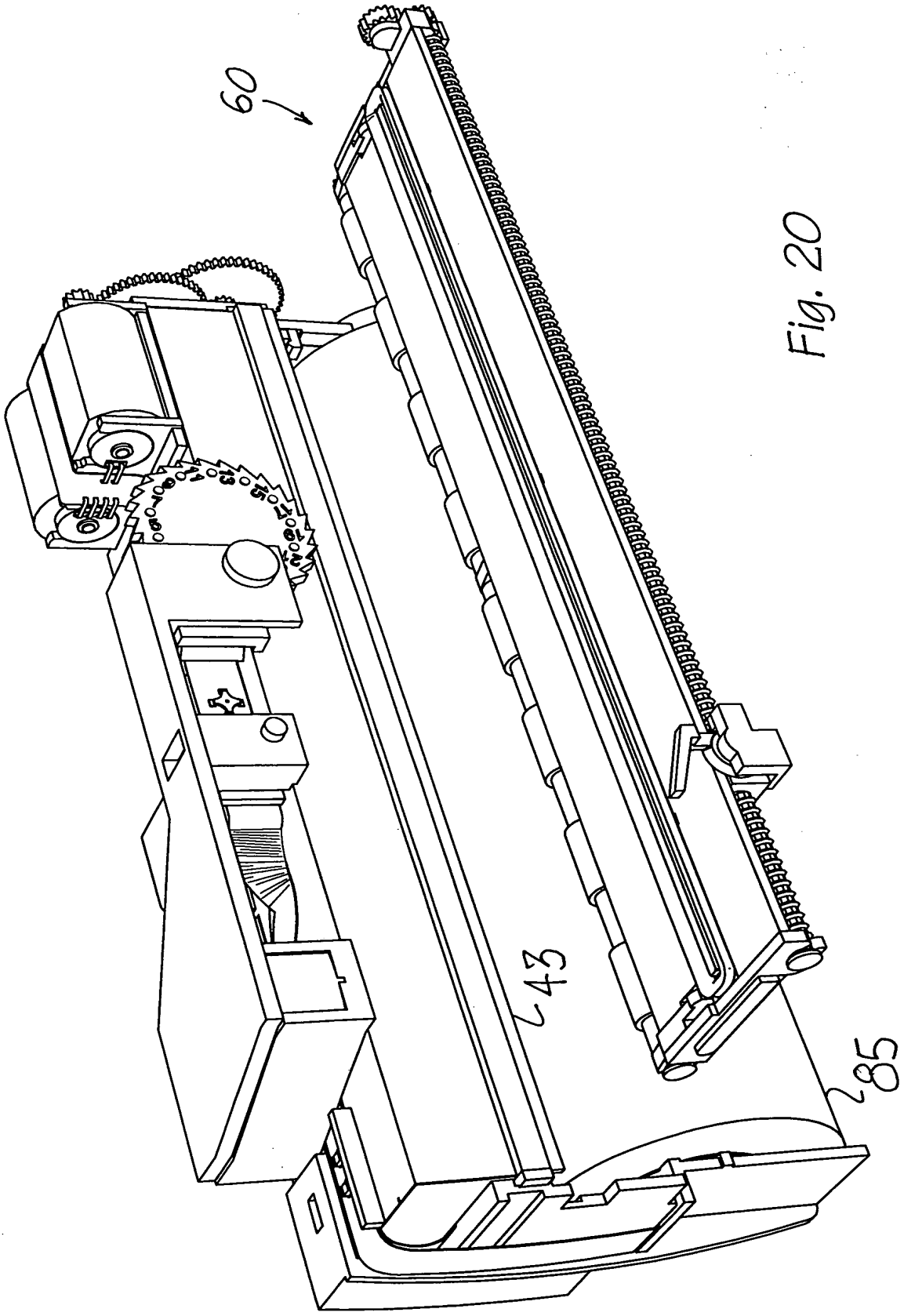

Fig. 20

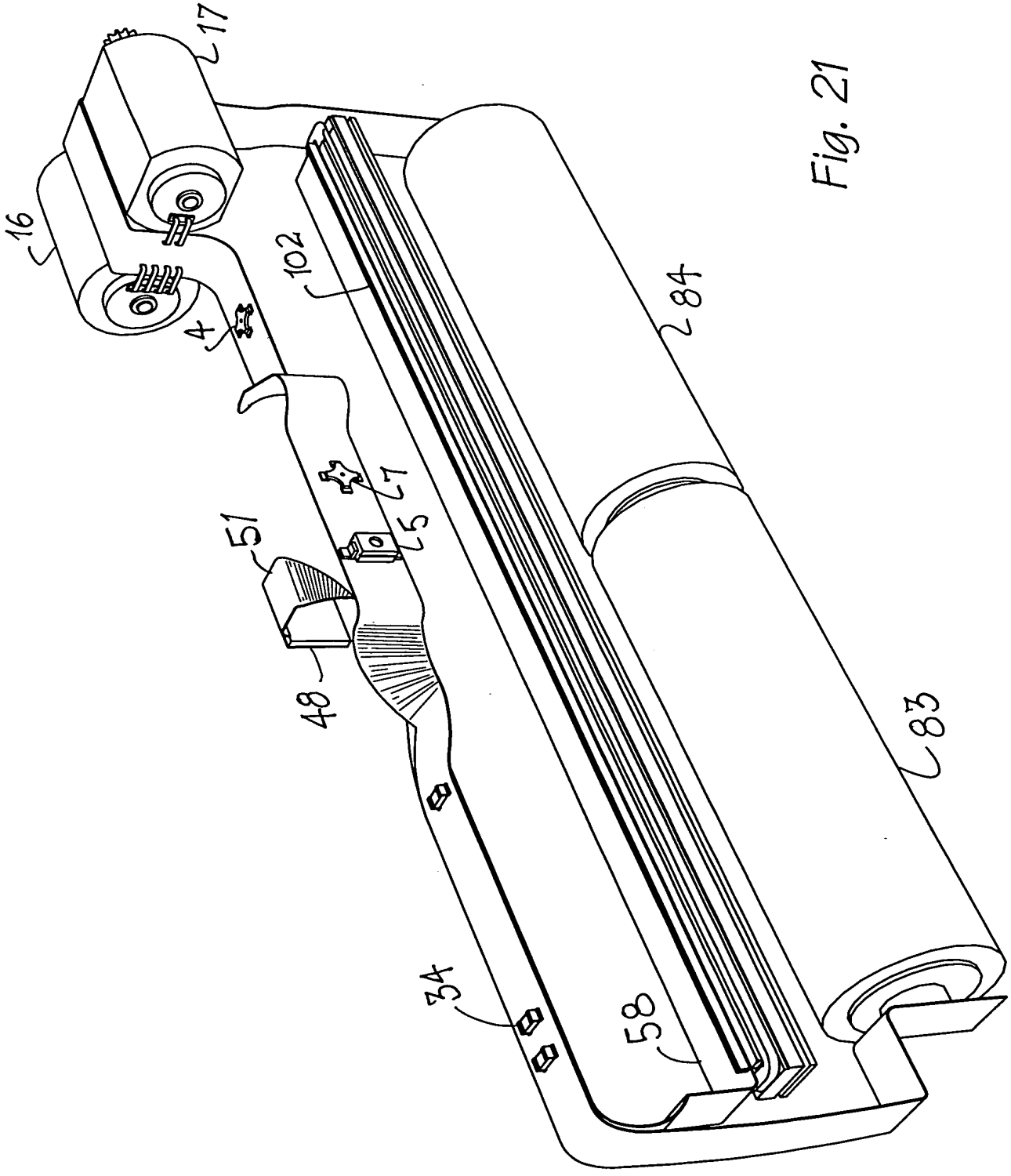

Fig. 21

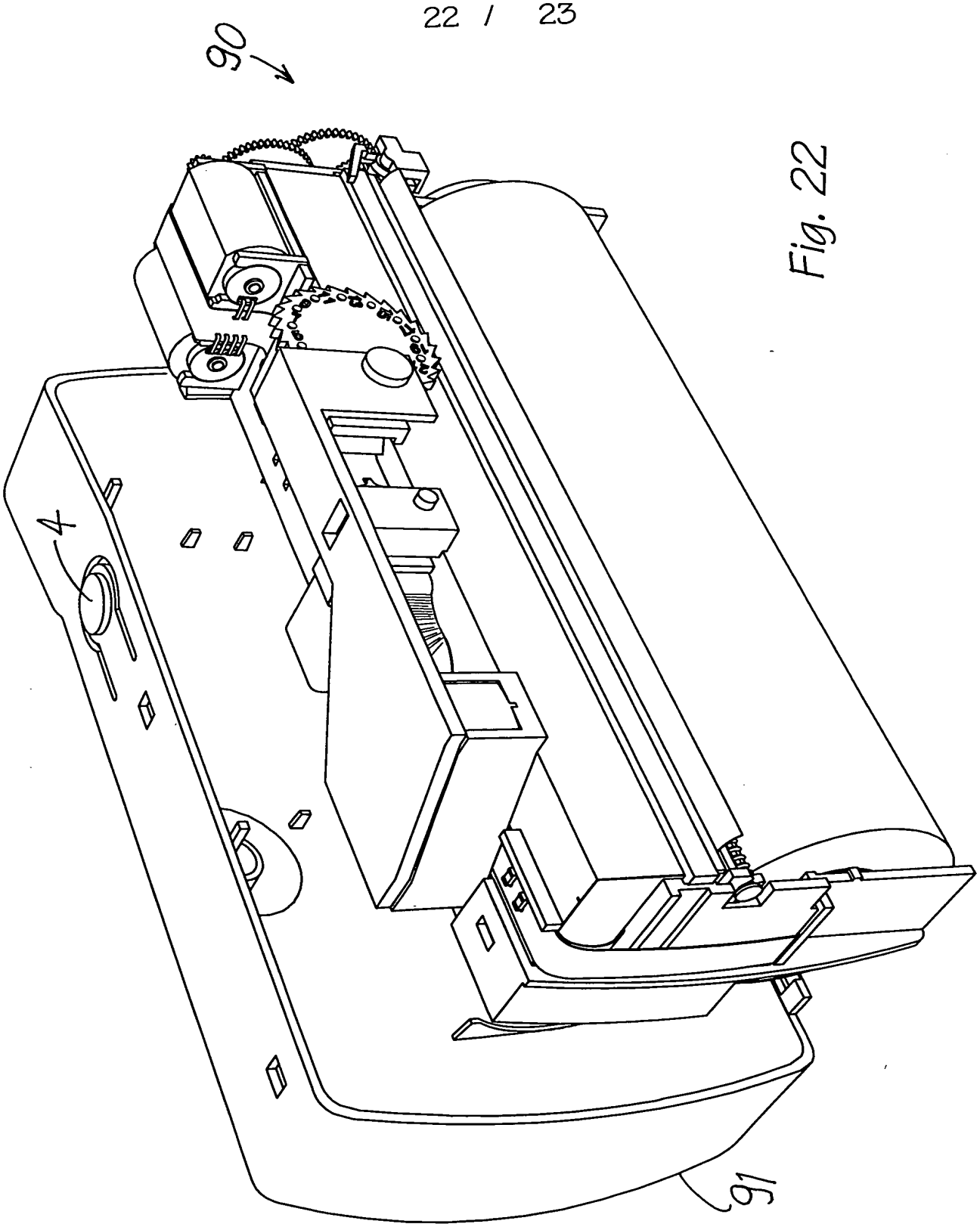

Fig. 22

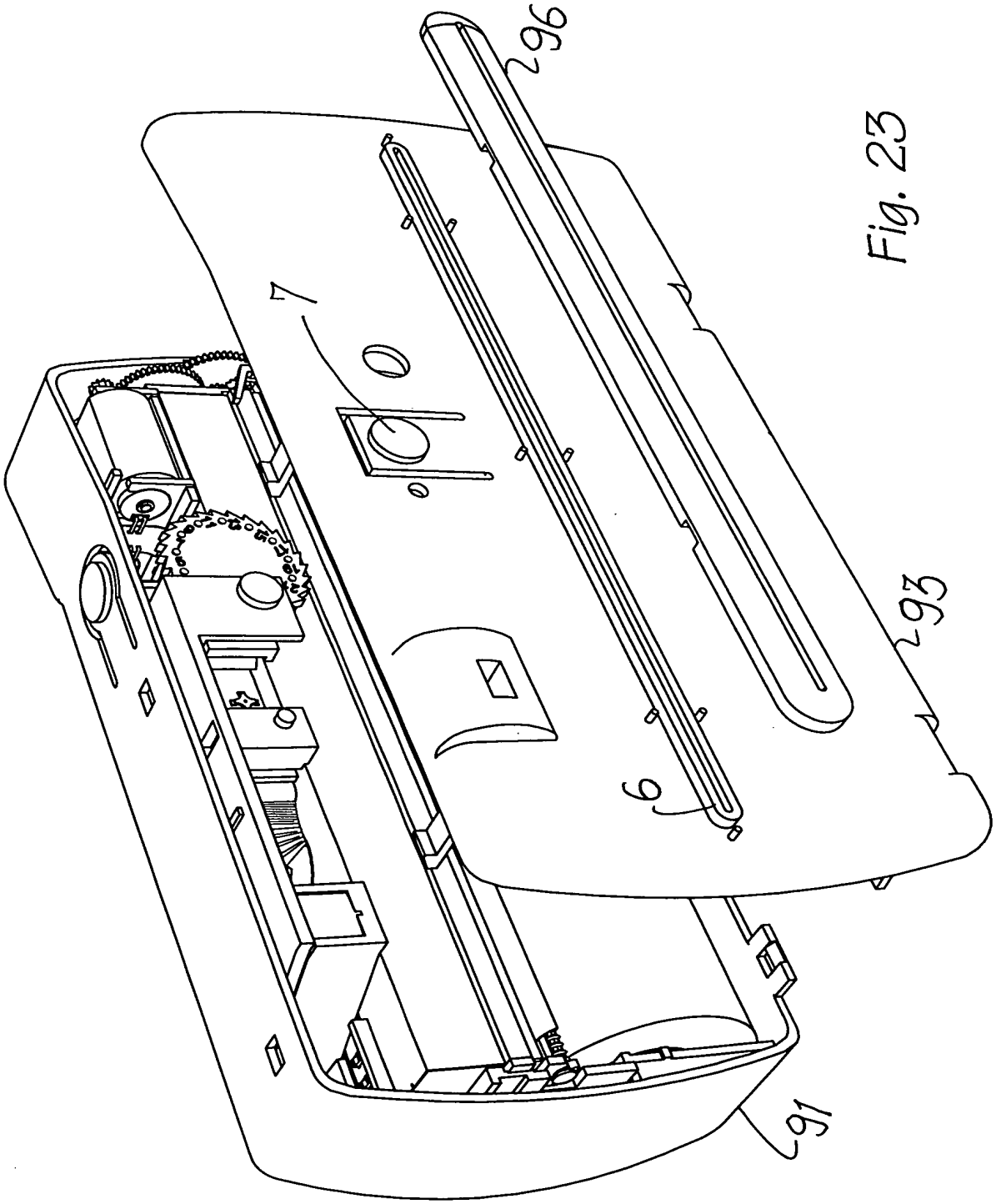

Fig. 23

Appendix A - Related Australian Provisional Patent Applications

The present provisional is one of a series of interrelated Australian Provisional Patent Applications filed as part of an ongoing development process conducted by the present Applicant and which together relate to a new image processing system which presents a large number of significant advances in a number of technological fields. These fields include, but are not limited to those set out in the following list:

- Camera technologies including Disposable Camera Systems
- Display technologies
- Image processing
- Ink Jet printing technology
- Semiconductor fabrication technology
- Micro Electro Mechanical Systems (MEMS)
- VLSI and ULSI fabrication including Thin Film Technology
- Magnetics
- Fluid dynamics
- Precision engineering
- Plastics molding
- Materials science
- Digital systems architecture
- Fluid Dynamics
- Precision Engineering
- Non-impact printing technologies
- Mechanical and stress analysis
- Ink Chemistry
- Electronics
- Electrostatics

Naturally with such a large number of significant advances, it is necessary to read this Application with its associated Australian Provisional Patent Applications to gain a thorough understanding of the operation of these technologies. The following tables set out a full list of the associated Australian Provisional Patent Applications filed concurrently herewith by the present applicant which should be referred to in obtaining a full understanding of the operation of the present invention:

Ink Jet Printing

A large number of new forms of ink jet printers have been developed to facilitate alternative ink jet technologies for the image processing system. Australian Provisional Patent Applications relating to these ink jets include:

Australian Provisional Number	Filing Date	Title
PO8066	15-Jul-97	Image Creation Method and Apparatus (IJ01)
PO8072	15-Jul-97	Image Creation Method and Apparatus (IJ02)
PO8040	15-Jul-97	Image Creation Method and Apparatus (IJ03)
PO8071	15-Jul-97	Image Creation Method and Apparatus (IJ04)
PO8047	15-Jul-97	Image Creation Method and Apparatus (IJ05)

PO8035	15-Jul-97	Image Creation Method and Apparatus (IJ06)
PO8044	15-Jul-97	Image Creation Method and Apparatus (IJ07)
PO8063	15-Jul-97	Image Creation Method and Apparatus (IJ08)
PO8057	15-Jul-97	Image Creation Method and Apparatus (IJ09)
PO8056	15-Jul-97	Image Creation Method and Apparatus (IJ10)
PO8069	15-Jul-97	Image Creation Method and Apparatus (IJ11)
PO8049	15-Jul-97	Image Creation Method and Apparatus (IJ12)
PO8036	15-Jul-97	Image Creation Method and Apparatus (IJ13)
PO8048	15-Jul-97	Image Creation Method and Apparatus (IJ14)
PO8070	15-Jul-97	Image Creation Method and Apparatus (IJ15)
PO8067	15-Jul-97	Image Creation Method and Apparatus (IJ16)
PO8001	15-Jul-97	Image Creation Method and Apparatus (IJ17)
PO8038	15-Jul-97	Image Creation Method and Apparatus (IJ18)
PO8033	15-Jul-97	Image Creation Method and Apparatus (IJ19)
PO8002	15-Jul-97	Image Creation Method and Apparatus (IJ20)
PO8068	15-Jul-97	Image Creation Method and Apparatus (IJ21)
PO8062	15-Jul-97	Image Creation Method and Apparatus (IJ22)
PO8034	15-Jul-97	Image Creation Method and Apparatus (IJ23)
PO8039	15-Jul-97	Image Creation Method and Apparatus (IJ24)
PO8041	15-Jul-97	Image Creation Method and Apparatus (IJ25)
PO8004	15-Jul-97	Image Creation Method and Apparatus (IJ26)
PO8037	15-Jul-97	Image Creation Method and Apparatus (IJ27)
PO8043	15-Jul-97	Image Creation Method and Apparatus (IJ28)
PO8042	15-Jul-97	Image Creation Method and Apparatus (IJ29)
PO8064	15-Jul-97	Image Creation Method and Apparatus (IJ30)
PO9389	23-Sep-97	Image Creation Method and Apparatus (IJ31)
PO9391	23-Sep-97	Image Creation Method and Apparatus (IJ32)
	12-Dec-97	Image Creation Method and Apparatus (IJ33)
	12-Dec-97	Image Creation Method and Apparatus (IJ34)
	12-Dec-97	Image Creation Method and Apparatus (IJ35)
	12-Dec-97	Image Creation Method and Apparatus (IJ36)
	12-Dec-97	Image Creation Method and Apparatus (IJ37)
	12-Dec-97	Image Creation Method and Apparatus (IJ38)

Fluid Supply

The following provisional patents relate to the supply of ink to a series of ink jet nozzles such as those set out in the aforementioned specifications:

Australian Provisional Number	Filing Date	Title
PO8003	15-Jul-97	Supply Method and Apparatus (F1)
PO8005	15-Jul-97	Supply Method and Apparatus (F2)
PO9404	23-Sep-97	A Device and Method (F3)

Ink Jet Manufacturing

Significant developments have occurred in the field of ink jet print head construction. These advances are included in the following Australian Provisional Patent Applications.

Australian Provisional Patent	Filing Date	Title

Number		
PO7935	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM01)
PO7936	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM02)
PO7937	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM03)
PO8061	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM04)
PO8054	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM05)
PO8065	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM06)
PO8055	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM07)
PO8053	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM08)
PO8078	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM09)
PO7933	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM10)
PO7950	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM11)
PO7949	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM12)
PO8060	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM13)
PO8059	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM14)
PO8073	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM15)
PO8076	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM16)
PO8075	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM17)
PO8079	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM18)
PO8050	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM19)
PO8052	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM20)
PO7948	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM21)
PO7951	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM22)
PO8074	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM23)
PO7941	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM24)
PO8077	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM25)
PO8058	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM26)

PO8051	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM27)
PO8045	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM28)
PO7952	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM29)
PO8046	15-Jul-97	A Method of Manufacture of an Image Creation Apparatus (IJM30)
PO8503	11-Aug-97	A Method of Manufacture of an Image Creation Apparatus (IJM30a)
PO9390	23-Sep-97	A Method of Manufacture of an Image Creation Apparatus (IJM31)
PO9392	23-Sep-97	A Method of Manufacture of an Image Creation Apparatus (IJM32)
	12-Dec-97	A Method of Manufacture of an Image Creation Apparatus (IJM35)
	12-Dec-97	A Method of Manufacture of an Image Creation Apparatus (IJM36)
	12-Dec-97	A Method of Manufacture of an Image Creation Apparatus (IJM37)
	12-Dec-97	A Method of Manufacture of an Image Creation Apparatus (IJM38)

MEMS Technology

The following application relate to Micro Electro-Mechanical Systems technologies:

Australian Provisional Patent Number	Filing Date	Title
PO7943	15-Jul-97	A device (MEMS01)
PO8006	15-Jul-97	A device (MEMS02)
PO8007	15-Jul-97	A device (MEMS03)
PO8008	15-Jul-97	A device (MEMS04)
PO8010	15-Jul-97	A device (MEMS05)
PO8011	15-Jul-97	A device (MEMS06)
PO7947	15-Jul-97	A device (MEMS07)
PO7945	15-Jul-97	A device (MEMS08)
PO7944	15-Jul-97	A device (MEMS09)
PO7946	15-Jul-97	A device (MEMS10)
PO9393	23-Sep-97	A Device and Method (MEMS11)
	12-Dec-97	A Device (MEMS12)
	12-Dec-97	A Device and Method (MEMS13)

Artcam Technologies

The following Australian Provisional Patent Applications relate to the a new field of image processing technology known as Artcam and the various uses of this technology:

Australian	Filing	Title

Provisional Patent Number	Date	
PO7991	15-Jul-97	Image Processing Method and Apparatus (ART01)
PO8505	11-Aug-97	Image Processing Method and Apparatus (ART01a)
PO7988	15-Jul-97	Image Processing Method and Apparatus (ART02)
PO7993	15-Jul-97	Image Processing Method and Apparatus (ART03)
PO8012	15-Jul-97	Image Processing Method and Apparatus (ART05)
PO8017	15-Jul-97	Image Processing Method and Apparatus (ART06)
PO8014	15-Jul-97	Media Device (ART07)
PO8025	15-Jul-97	Image Processing Method and Apparatus (ART08)
PO8032	15-Jul-97	Image Processing Method and Apparatus (ART09)
PO7999	15-Jul-97	Image Processing Method and Apparatus (ART10)
PO7998	15-Jul-97	Image Processing Method and Apparatus (ART11)
PO8031	15-Jul-97	Image Processing Method and Apparatus (ART12)
PO8030	15-Jul-97	Media Device (ART13)
PO8498	11-Aug-97	Image Processing Method and Apparatus (ART14)
PO7997	15-Jul-97	Media Device (ART15)
PO7979	15-Jul-97	Media Device (ART16)
PO8015	15-Jul-97	Media Device (ART17)
PO7978	15-Jul-97	Media Device (ART18)
PO7982	15-Jul-97	Data Processing Method and Apparatus (ART19)
PO7989	15-Jul-97	Data Processing Method and Apparatus (ART20)
PO8019	15-Jul-97	Media Processing Method and Apparatus (ART21)
PO7980	15-Jul-97	Image Processing Method and Apparatus (ART22)
PO7942	15-Jul-97	Image Processing Method and Apparatus (ART23)
PO8018	15-Jul-97	Image Processing Method and Apparatus (ART24)
PO7938	15-Jul-97	Image Processing Method and Apparatus (ART25)
PO8016	15-Jul-97	Image Processing Method and Apparatus (ART26)
PO8024	15-Jul-97	Image Processing Method and Apparatus (ART27)
PO7940	15-Jul-97	Data Processing Method and Apparatus (ART28)
PO7939	15-Jul-97	Data Processing Method and Apparatus (ART29)
PO8501	11-Aug-97	Image Processing Method and Apparatus (ART30)
PO8500	11-Aug-97	Image Processing Method and Apparatus (ART31)
PO7987	15-Jul-97	Data Processing Method and Apparatus (ART32)
PO8022	15-Jul-97	Image Processing Method and Apparatus (ART33)
PO8497	11-Aug-97	Image Processing Method and Apparatus (ART30)
PO8029	15-Jul-97	Sensor Creation Method and Apparatus (ART36)
PO7985	15-Jul-97	Data Processing Method and Apparatus (ART37)
PO8020	15-Jul-97	Data Processing Method and Apparatus (ART38)
PO8023	15-Jul-97	Data Processing Method and Apparatus (ART39)
PO9395	23-Sep-97	Data Processing Method and Apparatus (ART4)
PO8021	15-Jul-97	Data Processing Method and Apparatus (ART40)
PO8504	11-Aug-97	Image Processing Method and Apparatus (ART42)
PO8000	15-Jul-97	Data Processing Method and Apparatus (ART43)
PO7977	15-Jul-97	Data Processing Method and Apparatus (ART44)
PO7934	15-Jul-97	Data Processing Method and Apparatus (ART45)
PO7990	15-Jul-97	Data Processing Method and Apparatus (ART46)
PO8499	11-Aug-97	Image Processing Method and Apparatus (ART47)
PO8502	11-Aug-97	Image Processing Method and Apparatus (ART48)
PO7981	15-Jul-97	Data Processing Method and Apparatus (ART50)

PO7986	15-Jul-97	Data Processing Method and Apparatus (ART51)
PO7983	15-Jul-97	Data Processing Method and Apparatus (ART52)
PO8026	15-Jul-97	Image Processing Method and Apparatus (ART53)
PO8027	15-Jul-97	Image Processing Method and Apparatus (ART54)
PO8028	15-Jul-97	Image Processing Method and Apparatus (ART56)
PO9394	23-Sep-97	Image Processing Method and Apparatus (ART57)
PO9396	23-Sep-97	Data Processing Method and Apparatus (ART58)
PO9397	23-Sep-97	Data Processing Method and Apparatus (ART59)
PO9398	23-Sep-97	Data Processing Method and Apparatus (ART60)
PO9399	23-Sep-97	Data Processing Method and Apparatus (ART61)
PO9400	23-Sep-97	Data Processing Method and Apparatus (ART62)
PO9401	23-Sep-97	Data Processing Method and Apparatus (ART63)
PO9402	23-Sep-97	Data Processing Method and Apparatus (ART64)
PO9403	23-Sep-97	Data Processing Method and Apparatus (ART65)
PO9405	23-Sep-97	Data Processing Method and Apparatus (ART66)

IR Technologies

The following Australian Provisional Patent Applications filed concurrently herewith relate to a new form of disposable camera system and the various uses of this technology:

Australian Provisional Patent Number	Filing Date	Title
	12-Dec-97	An Image Creation Method and Apparatus (IR01)
	12-Dec-97	A Device and Method (IR02)
	12-Dec-97	A Device and Method (IR04)
	12-Dec-97	Image Creation Method and Apparatus (IR05)
	12-Dec-97	An Image Production System (IR06)
	12-Dec-97	Image Creation Method and Apparatus (IR10)
	12-Dec-97	Image Creation Method and Apparatus (IR12)
	12-Dec-97	A Device and Method (IR13)
	12-Dec-97	An Image Processing Method and Apparatus (IR14)
	12-Dec-97	A Device and Method (IR16)
	12-Dec-97	A Device and Method (IR17)
	12-Dec-97	A Device and Method (IR18)
	12-Dec-97	A Device and Method (IR19)
	12-Dec-97	A Device and Method (IR20)
	12-Dec-97	A Device and Method (IR21)

Abstract

A camera system is disclosed comprising: an image sensor device for sensing an image; a processing means for processing the sensed image; a print media supply means for the supply of print media to a print head; a print head for printing the sensed image on the print media stored internally to the camera system; a portable power supply interconnected to the print head, the sensor and the processing means; and a guillotine mechanism located between the print media supply means and the print head and adapted to cut the print media into sheets of a predetermined size. Further, preferably, the guillotine mechanism is detachable from the camera system. The guillotine mechanism can be attached to the print media supply means and is detachable from the camera system with the print media supply means. The guillotine mechanism can be mounted on a platten unit below the print head.